NORMAL

METHODS OF TEACHING

BROOKS

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CONTAINING

A BRIEF STATEMENT OF THE PRINCIPLES AND METHODS OF THE SCIENCE AND ART OF TEACHING, FOR THE USE OF NORMAL CLASSES AND PRIVATE STUDENTS PREPARING THEMSELVES FOR TEACHERS.

BY

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"The object of all education is to teach people to think for themselves."

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PREFACE.

TEACHING is a Science and an Art. It embraces a system of truths that admit of scientific statement and may be woven together with the thread of philosophic principles. As such it may be taught like other sciences and arts, and may thus be presented in a book to be studied. The present volume is the result of an earnest attempt to give a scientific statement to the subject in a form that can be used in the training of teachers.

Object.—The work is designed as a *Text-Book on Teaching.* It is a work to be studied and mastered by those who are preparing themselves to teach in our public shools. Several good books on the subject have been written from the standpoint of the profession for professional readers; this work is written from the standpoint of the class-room, for those who are being trained for the profession. Its design is not so much to adorn the literature of the profession as to aid in building up the profession. The aim has been to prepare a work suitable for the use of the classes in our Normal Schools,—a work that can be studied and recited like a text-book on grammar or arithmetic.

Origin.—The work grew up in the class-room. The matter was originally prepared for my own "teaching classes," and has been used by them for many years. Primarily, it was given orally to the classes, the pupils being required to write down only the leading definitions and principles and an outline of the discussions. Recently it became necessary to divide these classes and place them in charge of assistant teachers. For the use of these assistants the notes were expanded into a little treatise which the pupils were required to copy and recite. So inconvenient was this, and so much valuable time was lost, that I resolved to comply with the request of teachers and pupils and put the matter in a form for publication.

Importance.—The need of such a text-book cannot be questioned.

The subject itself demands it. Teaching is a science and an art, and as such deserves to be stated in a scientific form. The teachers and students of Teaching demand it. The time has gone by when talks and lectures on the subject of Teaching will meet the wants of Normal instruction. The pupils need a book which they can study and recite; they want to see that they are making actual progress in Teaching as in other branches. In our Normal Schools the science of Teaching must be placed alongside of the other branches for exactness of statement, if it is to be respected and appreciated by students. Close study of mathematics and general talks on Teaching will never give pupils a very high appreciation of the Science of Teaching.

We need such a work also for the teachers not attending our Normal Schools. County Superintendents tell young teachers to read and study works on Teaching ; and the question is, what shall they study? "How can we prepare ourselves in the science of Teaching?" is the question that comes up from every part of the State. There are several excellent works on the subject ; but they do not seem to be adapted to their wants. Some are too profound ; and others are deficient in systematic thought and statement. There seems to be no elementary text-book in which they can find that systematic and concise statement of definitions and principles and detailed description of practical methods of teaching the branches, which they need. It is the hope of the author that the present work may meet this want, and supply this demand.

Nature and Contents.—A work on Teaching should be moulded by the wants of the student of Teaching. The student needs a *systematic* and *comprehensive view* of the entire subject. He needs carefully prepared *definitions* and *statements* of the different divisions and topics. He needs a clear and definite statement of *principles* which he may fix in his mind, and which become as germs to his thought and practice in teaching. He needs to be able to give clear and logical *discussions* of the principles, and to show their *application* to the methods adopted. He needs to be able to state the various *methods of teaching,* give *illustrations* of these methods and show their adaptation to the different subjects. He needs to be drilled in the *literature* of teaching, to acquire a vocabulary of educational expressions that convey to his mind definite ideas like the terms and definitions of grammar and arithmetic. The student-teacher should study these until they become part of his educational vocabulary, as a student of law studies Blackstone until he becomes habituated to legal forms of thought and expression.

The work aims to meet all these requirements. It presents, first, a scheme of a *complete system* of education, the *principles* on which it is based, and the *nature* and *laws* of its two principal divisions, *Culture* and *Instruction.* It presents, second, a detailed description of the *methods of teaching the different branches* of study. In discussing these Methods, it gives, first, a description of the *general nature* of each branch, and second, the *methods of teaching it.* The former division embraces a statement of the *philosophical character* of the branch and its *historical developments*, both of which are of great value, since the nature of a branch determines the method of teaching it, and the historic order of its growth often indicates the order in which it should be developed in the pupil's mind. The methods of teaching each branch include, first, the *principles*, which should guide the teacher in his work ; second, the *several methods* that may be employed, indicating the correct method ; and third, descriptions and illustrations for actual *model lessons* in the branches.

The Style.—As the work is designed for a text-book, special pains have been taken to employ a simrle, clear, and concise style. All rhetorical ornament and diffuseness of description have been carefully avoided, and the attempt made to reduce the matter to a scientific form, and to state it in brief and simple sentences suitable for recitation. The author has endeavored to keep his classes of pupils before his mind, and aimed to adapt his statements to their comprehension and powers of expression. Nearly every paragraph has been written in view of the thought, How will this answer for pupils to study and recite? The object has been, not to talk about the subject, but to embody the subject in language, and thus make a text-book on Teaching.

Correctness of Methods.—It is believed that the principles and methods presented are not mere theories ; nearly all of them have been tested by actual experience in the class-room. There is scarcely a method suggested that I have not either tested myself, or had tested by my teachers in our Normal or Model School; and hundreds of teachers have introduced them into the public schools of the State and proved their correctness by successful teaching. Many of the methods are used by the leading teachers of the country, and are generally accepted as correct. For any methods presented which may seem novel, and in advance of popular practice, I ask an impartial consideration, believing that if tried, they will also prove to be worthy of acceptance.

Origin of Matter.—In the preparation of the work, no attempt has been made to be merely original. The object has been to present the subject as it lies in my own mind and as it is thought it should be conceived by young people preparing to teach. The subject has developed itself in its present form through years of reading, reflection, and experience; and it is impossible to separate, even if it were necessary, what has been acquired from that which is the product of the author's own thought. Whenever I am conscious of following anything peculiar to another author, an acknowledgment is made; and it is possible that credit should have been given in some cases where it has been withheld. The historical facts have been taken from various sources, and, in some cases, the language has been partially followed.

In closing this preface, I desire to express the hope that the book, though written specially for my own pupils, may be of value to many of the young teachers of our country; and that it may aid in lifting up the practice of teaching to a higher plane, and afford means for that professional culture now so generally demanded. Having written the work in the interests of teachers, I shall find my highest reward in the knowledge that it has proved a benefit to teachers, and done something towards building up one of the best and noblest interests of society—the *Profession of Teaching.*

EDWARD BROOKS.

Normal School, Millersville, Pa.
May 10, 1879.

TABLE OF CONTENTS.

PART II.

TEACHING THE BRANCHES.

I. OBJECT LESSONS.

CHAPTER I.

II. LANGUAGE.

CHAPTER I.

CHAPTER II.

CHAPTER III.

CHAPTER IV.

CHAPTER V.

CHAPTER VI.

CHAPTER VII.

CHAPTER VIII.

CHAPTER IX.

III. MATHEMATICS.

CHAPTER I.

CHAPTER II.

CHAPTER III.

PART I.

INTRODUCTION.

NATURE OF EDUCATION.

I. The Nature of Education.

II. General Principles of Education.

III. The Science of Teaching.

IV. The Nature of the Mind.

V. The Nature of Culture.

VI. The Culture of Each Faculty.

VII. The Nature of Knowledge.

VIII. The Forms of Instruction.

IX. The Order of Instruction.

X. The Principles of Instruction.

NORMAL

METHODS OF TEACHING.

CHAPTER I.

THE NATURE OF EDUCATION.

EDUCATION treats of the developing of the powers of man and the furnishing of his mind with knowledge. The term *education* is derived from *educare*, to teach, which is from *educere*, to lead out, which is from *e*, out, and *duco*, I lead.

The primary idea of education, as shown by the origin of the term, seems to be the developing or drawing out of the powers of the mind; and it has been supposed that this was its earliest use. It is said to be doubtful, however, whether the Romans ever used the word in this sense, though most modern writers have so understood it. The term has, at the present day, so broadened its meaning as to embrace both the development of man's powers and the furnishing of his mind with knowledge.

Problem of Education.—The problem of education em braces several distinct elements, as will appear from the following analysis. First, there must be a being to be educated; this being is *Man*. Second, there must be something with which to educate man, some material to be used in the educational process; this material, consisting of ideas, facts, truths, and sentiments, may be called the *Matter* of education.

Third, there must be some way in which these two elements are united in the educational process; this way (*methodos*, a way) gives rise to the *Methods* of Education.

The problem of education is thus seen to embrace three elements—*Man*, *Matter*, and *Method*. *Man* is the subjective element; *Matter* is the objective element; and *Method* is the process by which these two are linked together in the attainment of educational results. The old problem of common school education has been facetiously called the problem of "the *three R's*—readin', 'ritin', and 'rithmetic;" the real problem of education may be seriously called the problem of the *three M's*—Man, Matter, Method.

Branches of Education.—This analysis of the problem of education enables us to determine the fundamental branches of the science of education. Considering *Man*, the first element of the problem, we see that he has susceptibilities and powers which may be trained and developed. The process of bringing forth these powers in activity, strength, and harmony, we call *Culture*. This culture is not a thing of chance; there is a proper way in which it is to be given. The consideration of the manner in which this culture is to be imparted, gives rise to the first branch of the science called *Methods of Culture*.

Considering the *Matter*, the second element of the problem, we perceive that knowledge, which is a product of the mind, may be used in giving culture to the mind. That which came forth from one mind may be developed in other minds, calling into activity the faculties by which it was originally produced. This process of developing knowledge in the mind is called *Instruction*. The consideration of the manner in which instruction may be imparted gives rise to a second branch of the science called *Methods of Instruction*.

At first thought, since culture and instruction are seen to embrace all possible educational processes, it would seem that these two branches constitute the entire science of education.

A little further analysis, however, gives rise to another branch closely connected with these two primary branches, and possibly contained in them, but so important as to be regarded by some as coördinate with these two, and requiring a distinct treatment. Thus, since culture and instruction are to be given to a number of pupils together, called a school, and this school is to be organized, governed, etc., there arise other subjects not immediately embraced in, or at least not conveniently treated under, the two primary branches of the science. On account of the intimate relation of these several subjects, educators have treated them under one head, and regarded it as a distinct branch of the science, which has been appropriately named by Dr. Wickersham, *School Economy.*

The science of education is thus seen to embrace three branches—*Methods of Culture*, *Methods of Instruction*, and *School Economy.* This three-fold division of the science is not new, although it is recent. It is not so much of a discovery as a growth. It seems to have been gradually developing in the minds of educators for many years, and is now largely accepted by the profession as a logical and complete classification.

Culture and Instruction.—Culture is the developing of the powers of man. It is the art of drawing out the different powers and training them so that they may act with skill and vigor. Instruction is the furnishing of the mind with knowledge. The mind may be furnished with knowledge in two ways; first by putting knowledge into the mind, and second by drawing knowledge out of the mind. In the fact studies, as history and geography, knowledge must be put into the mind; in the thought studies, as arithmetic and grammar, knowledge can be unfolded in the mind. Instruction is thus the art of putting knowledge into the mind and also of drawing knowledge out of the mind. In other words, instruction is the art of developing knowledge in the mind, or of building up knowledge in the mind. These two divisions, Culture and Instruction, are logically distinguished. The one seeks to draw out the powers of the mind; the other seeks to furnish the mind with knowledge. The former is purely subjective, working from within outward; the latter is partly objective and partly subjective, as knowledge is both put into the mind and drawn out of it. Each, of course, implies the other. To give culture, we make use of knowledge; in imparting instruction there must be some growth of the mental powers. The two processes, however, are not identical; and the laws and methods of each are different. They are in fact the complements of each other; the two hemispheres of the science, which, united, give it symmetry and completeness.

Nature of Teaching.—The act of affording this culture and imparting this knowledge is called *Teaching;* and the person who does this work is called a *Teacher.* The term Teaching is also used as the name of the science and art of giving culture and instruction. Thus we speak of the Science of Teaching and the Art of Teaching.

The term *Teaching*, it is thus seen, is a little more comprehensive than the word Instruction. An Instructor, strictly speaking, is one who furnishes the mind with knowledge; a Teacher is one who furnishes the mind with knowledge and, at the same time, aims to give mental culture.

Other Terms.—The term *Educator* is popularly defined as one who educates or gives instruction. It is more appropriately used, however, to denote one who is versed in, or who advocates and promotes, education. The term *Educationist* is also employed in this latter sense, and by many is preferred to the term Educator.

The term *Pedagogics*, or *Pedagogy* (*pais*, *paidos*, a boy, and *agogos*, leading or guiding), is used by quite a large number of writers as the name of the science and art of instruction. The term is popular in Germany, and efforts have been made to introduce it into this country and England; but so far with but little success. It is somewhat awkward and unmusical, besides which, the term pedagogue is, in both of these countries, used as a term of reproach.

The term *Didactics*, from *didasko*, I teach, is often used as the name of the science and art of teaching. The subject has been divided into two parts: *General Didactics*, which presents the principles of teaching; and *Special Didactics*, or *Methodics*, which applies these principles to the several branches of instruction. The term is appropriate and may in time be adopted, but the term Teaching seems at present to be generally preferred.

Kinds of Education.—Education is generally divided into Physical Education, Intellectual Education, and Moral and Religious Education. Physical Education is that which pertains to the body. Its object is to train every power of the body for the attainment of the ends of *health*, *strength*, *skill*, and *beauty.*

Intellectual Education is that which pertains to the intellect. Its object is to develop all the mental faculties into their highest activity, and to furnish the mind with valuable and interesting knowledge. Moral Education is that which pertains to the moral nature of man. Its object is the development of conscience and the subordination of the will to the idea of duty. Religious Education has reference to the development of the higher spiritual instincts and sentiments forming the religious nature. It is especially distinguished from moral education in that the former finds its motive in human relations, and the latter in the existence of a Supreme Being.

Besides these there are also several subordinate or collateral divisions; as Æsthetic Education, which refers to the culture of the imagination and taste; Domestic Education, which refers to the education of children in the household; Common School Education, which refers to the education obtained in a common school; Popular Education, which refers to the education of the people; and National Education, which refers to a system of education provided by the state.

CHAPTER II.

GENERAL PRINCIPLES OF EDUCATION.

EDUCATION is not a matter of chance or haphazard procedure. All development must proceed in accordance with some regular plan or order. There can be no organic growth without the control of principles determining and shaping the development. The plant grows in obedience to the laws of vegetable life; and the development of mind, which is the object of education, must be controlled by the laws of its own being.

A system of education must therefore be based upon certain broad and fundamental principles which express the laws of human life and development. These principles are not only the foundation upon which the system rests, but they give shape and character to the entire superstructure. All the great writers on education have conceived some lead ing ideas and endeavored to unfold a scheme of instruction growing out of these fundamental conceptions.

From a very careful survey of these different schemes and a thorough examination of the problem of education itself, the following principles have been reached which seem to contain a complete system of education. These principles, it is thought, embrace all the fundamental ideas of education from Aristotle to Pestalozzi and Frœbel. The design is to enumerate only the general laws of education; the particular laws of culture and instruction will be presented in another place. These principles are presented in ten propositions, which we may call our *educational decalogue.*

1. *The primary object of education is the perfection of the individual.* The educator should understand the object

for which he labors; for the object to a large extent determines the means and methods employed in the work. A correct end in view will lead to correct methods; a false object will vitiate both the means and the methods of using them. In education, especially, the end aimed at crowns the work with excellence.

The true object of education has not been generally understood by educators and parents. The ancient Greeks made a fundamental mistake when they based their system upon the perfection of the state rather than the individual. Parents to-day send their children to school to fit them for business or a profession, to enable them to make a good living in the world, or to occupy an honorable position in society. Teachers often seem to think more about the amount of knowledge they are imparting to the child than of the training of its mind and the development of a manly and virtuous character. All of these objects fall below the high ideal we should set before us, and degrade and injure the work of education.

We should, therefore, remember that the true object of education is *the perfection of the individual.* We should aim for the perfecting of man in his entire nature,—physically, mentally, and morally. The teacher should never forget that the highest object of his work is the fullest and most complete development of the immortal beings committed to his care: and that his work is not only for time but for eternity. In other words, it should be remembered that the highest object of education is *human perfection.*

2. *The perfection of the individual is attained by a harmonious development of all his powers.* Man possesses a multiplicity of capacities and powers, all of which contribute to his well-being and his dignity. A perfectly developed manhood or womanhood implies the complete development of every capacity and gift. These powers are so related that they may be unfolded in very nearly equal proportions, and harmoniously blend in the final result. For the attainment

of our ideal such a development is required. The educational work should reach every power, and aim at a full and harmonious development of them all.

This principle is limited by the existence of special talents and the demand for special duties. While a general scheme of education should seek to give culture to all the powers, we should not be neglectful of special and unusual gifts. Genius should be recognized, and our general system be so far modified as to give opportunity for its highest development and achievements. An unusual gift for poetry, music, painting, mechanics, mathematics, etc., should be recognized, and opportunity offered for its fullest development.

We must remember also that duties are diverse as well as talents, and that special training is needed for the preparation of mankind to discharge these special duties. There must be farmers, and artisans, and physicians, etc., and they need special preparation for their work; and educational systems must recognize this fact and provide for it.

The principle of harmonious development has reference to that general educational preparation which all persons need for their own personal excellence, and as a preparation for a special course of instruction to prepare them for specific duties and occupations. The general scheme of education should therefore aim at a full and harmonious development of all of man's powers.

3. *These powers develop naturally in a certain order, which should be followed in education.* Intellectual life seems to begin in the senses; the child awakens into knowledge through sensation and perception. Then follows the action of the memory as a retaining and a recalling power, accompanied by imagination as the power of representation. After this come judgment and reasoning and the power of abstraction, generalization, and classification. Still later we become conscious of the intuitive ideas and truths, and learn to work them up into new truths by the power of deductive thought.

Last of all, the mind awakens to the consciousness of man as a moral and religious being, bearing relations to his fellow man and to God.

Finding in man such a relation of faculties and powers, we should learn the order of their development and follow that order in our work. We should first afford food for the growth of the mind through the senses. We should call the memory into activity, and afford means for the culture of the imagination. We should lead the mind gradually from things to thoughts, and give activity to judgment and reasoning, and also to the powers of abstraction and generalization. Desires should be awakened and directed, the affections unfolded, and the will be subordinated to the ideas of truth and duty

Though these powers develop in a certain order, it is not to be thought that the activity of one waits upon the full development of another. To a certain extent they are all active at the same time; but they are active in different degrees. The order given represents the relative activity, and thus indicates the relative attention required to be given them in the work of education. Such a relation should be clearly understood by the educator, and should guide him in his work.

4. *The basis of this development is the self-activity of the child.* Education is a spiritual growth, and not an accretion. It is a development from within, and not an aggregation from without. For this growth there must be forces working within the child. This force is the self-activity of the soul, going out towards an object as well as receiving impressions from it; gaining power in the effort, and working up into organic products the knowledge thus acquired.

The object of education is to stimulate and direct this natural activity. The teacher, therefore, should never do for the child what it can do for itself. It is the child's own activity that will give strength to its powers and increase the capacity of the mind. The teacher must avoid telling too much, or aiding the child too frequently. A mere hint or suggestive question to lead the mind in the proper direction is worth much more than direct assistance, for it not only gives activity and consequently mental development, but it cultivates the power of original investigation.

We should aim to cultivate a taste and desire for knowledge on the part of the child, so that this activity may be natural and healthful. To force the mind to the reception of knowledge is not education, it is cramming; and the object of education is not cram but culture. For the attainment of the high end of education, therefore, we must depend on the self-activity of the child; and it is the teacher's office to excite and direct this activity.

5. *This self-activity has two distinct phases; from without inward,—receptive and acquisitive; and from within outward,—productive and expressive.* First, the mind is receptive of knowledge. Objects of the material world make their impressions upon the senses, and ideas and thoughts spring up in the mind. Knowledge thus comes into the mind from without through the senses. The contents of books also flow into the mind through written language, and are treasured in the memory. In all this the mind is receptive, the process is from without inward, and the result is acquisition, learning.

The mind is also active in creating as well as in receiving. It has the power to reproduce as well as to receive. In its self-activity it can take the material thus acquired, and work it up into new products. It can also send it forth on the stream of clear and definite expression in audible or visible speech. It thus works from within outward, creating, and evolving what it creates.

The mind in its receptive phase is said to be intuitive; that is, the knowledge comes directly into the mind. The mind in the second phase is called elaborative, because it works up the material into new products. This distinction has also an educational significance.

6. *These two phases, the receptive and productive, should go hand in hand in the work of education.* This is evident from their natural correlation. The activity of the mind in receiving naturally creates the correlative activity of producing. The knowledge coming into the mind through the receptive capacity excites the mind to a productive activity. It acts like food in the stomach, which excites the powers of digestion and assimilation. Besides, the knowledge gained by the receptive powers becomes the material for the production of the creative powers. This material is operated upon and worked up into new products.

These two operations are not to be separated in education. Each gives life and vigor to the other. The receptive powers are stimulated by the activity of the productive powers, and the productive powers are set into immediate activity by the presence of receptive knowledge. They thus play into each other's hands, act as a mutual stimulus to each other, and should go hand in hand in the work of education.

7. *There must be objective realities to supply the condition for the self-activity of the mind.* The mind cannot act upon itself alone; there must be food for the mental appetite. There must be an external world of knowledge to meet the wants of the internal knowing subject.

Such an external world is supplied. There is a world of knowledge suited to and correlating with the wants of the soul. The objective world of nature is found to be an embodiment of thought, and this thought developed into science meets the wants of the active spirit. There is also the great world of space and number, with its ideas and truths; and also the loftier abstractions of the True, the Beautiful, and the Good.

This world of knowledge is adapted to every power and capacity of the mind. This is evident, since knowledge is the product of the mind operating upon external realities. Knowledge as the product of one mind must be suited to the different capacities of all other minds. It is thus seen that there is abundant provision for the activity and growth of all of the powers of the mind.

8. *Education is not creative; it only assists in developing existing possibilities into realities.* The mind possesses innate powers. These may be awakened into a natural activity. The design of education is to aid nature in unfolding the powers she has given. No new power can be created by education; the object is to arouse those which exist to a healthful activity, and to guide them in their unfolding. In other words, the object of education is to aid nature in unfolding the possibilities of the child into the highest possible realities.

9. *Education should be modified by the different tastes and talents of the pupil.* All minds possess the same general capacities or powers. These powers are, however, possessed in different degrees. An unusual gift of any one or more powers constitutes genius. Tastes or dispositions for particular branches of science or art also differ.

Such differences should not be overlooked in a scheme of education. While all should receive a course of general culture, opportunity should be given for the development of special tastes and gifts. It is these which enrich science and art, and add to the sum of human knowledge; and the progress of science and art demands that genius shall have the most abundant opportunities for its fullest and highest development.

10. *A scheme of education should aim to attain the triune results—development, learning, and efficiency.* Development relates to the culture and growth of the powers of the child. This is the fundamental idea of education, and is of primary importance. Education has reference also to the acquisition of knowledge. It aims to enrich the mind with the truths of science, to make a man learned, to produce scholars.

A third object is the acquisition of skill in the use of culture and knowledge. It is not enough that the mind has well-developed powers and is richly furnished with knowledge. There should be the power to make use of this culture and knowledge. The educated man should be able to *do* as well as to *think* and *know*. This third design of the educator, the attainment of skill, should not therefore be overlooked. The true aim of education is thus seen to be the attainment of the three ends—*culture*, *knowledge*, and *efficiency*.

CHAPTER III.

THE SCIENCE OF TEACHING.

TEACHING, as a science, treats of the *Laws* and *Methods* of human *Culture* and *Instruction*. The term is derived from the Saxon word *twcan*, which meant to show, to teach, and is allied to the Greek *deiknunai*, to show, and the Latin *docere*, to teach.

Primarily, the word appears to have meant very nearly the same as the word instruction; though even in its primary sense of directing or showing, it is suggestive of the act of developing the mind as well as instructing it. At the present day, Teaching embraces both Culture and Instruction,—the bringing out and training of the powers, as well as the furnishing of the mind with knowledge. A true teacher seeks to cultivate the minds of his pupils as well as to instruct them.

Laws and Methods.—The definition of Teaching embraces four distinct and prominent ideas,—*Laws*, *Methods*, *Culture*, and *Instruction*. By LAWS we mean the principles that guide us in an operation. Thus, in grammar, the principle that the verb agrees with its subject in number and person, will guide us in speaking and writing correctly. So the principles of numbers enable us to operate with them correctly in applying them to the business transactions of life.

By METHODS we mean the manner of performing an operation. Thus, in arithmetic we have the methods of subtracting, of finding the greatest common divisor, etc. The rules of arithmetic are statements of methods of operation. So also in education, there are methods of doing things or of obtaining certain results. There are methods of giving culture to the different faculties, and also of teaching the different branches.

The relation of Laws and Methods should be clearly understood. Principles are self-existent, or belong to the very nature of the subjects; Methods are derived from principles; they are the outgrowth of laws or principles. Principles are of more value than methods; if you know the principle, you can derive the method, though you may know the method without understanding the principle. One who is familiar with principles is thus much more independent than one who knows only methods. These relations of principles and methods may be illustrated in arithmetic and grammar, and in other school studies.

Culture and Instruction.—CULTURE is the developing of the powers of man. The term is derived from *colo*, I cultivate, and derives its educational meaning from the act of tilling and enriching the soil. It has reference to the development and improvement of any of man's faculties or powers. To awaken the mind into activity, to call out and mould its various faculties, to train the eye to see, the memory to retain and recall, the understanding to think and reason, etc.,—this is to cultivate the mind.

INSTRUCTION is the furnishing of the mind with knowledge. It is the process of developing knowledge in the mind of another. The term is derived from *in*, into, and *struo*, I build, meaning, I build into. To instruct the mind is thus to furnish it with knowledge, to build up knowledge in the mind. The instructor takes the knowledge that is in his own mind, and puts it into the minds of his pupils; or he develops knowledge in the minds of his pupils, and builds it up there, as an architect erects a temple, in symmetry and proportion.

The relation of Culture and Instruction should be clearly understood. The object of Culture is to strengthen and develop the mind; the object of Instruction is to furnish the mind with knowledge. Culture gives a person mental power; Instruction gives him information or learning. They are both important; but Culture is more important than mere Instruction.

To be able to acquire knowledge is worth more than the knowl edge we have acquired. The ability to originate knowledge is even more important. A person should know more than he ever learned; and this is possible when his powers have been cultivated. The object of the teacher, therefore, should be not merely to impart knowledge, but to cultivate mental power.

Teaching a Science.—Teaching is both a science and an art. That it is a science, which has been questioned, will appear from the following considerations: To constitute a science we must have three things: 1. Knowledge; 2. Knowledge systematized; 3. Principles showing the relations of this knowledge, and binding it together into an organic unity. There is a knowledge of teaching, as is attested by the many works and articles written upon the subject. This knowledge can be systematized as logically as the knowledge of grammar or arithmetic. There are also fundamental principles of teaching, which express the laws of culture and instruction. Hence, from the definition of a science, we can claim that there is a science of teaching.

Branches of Teaching.—The Science of Teaching is divided into three branches; *Methods of Culture*, *Methods of Instruction*, and *School Economy*. This three-fold division embraces everything that pertains to teaching, and is therefore regarded as exhaustive. Indeed, as previously stated, since man can only be cultured and instructed, it would seem that there could be only two distinct branches, Methods of Culture and Methods of Instruction; but since this work is to be done with the pupils organized into a school, and since such an organization gives rise to special regulations and provisions, there incidentally arises a third division, called School Economy.

METHODS OF CULTURE treats of the nature of the powers of man, and how to develop them. It embraces three general divisions: 1. The Nature of Man; 2. The Nature of Culture; 3. The Methods of Cultivating each Faculty. In a full treatise upon this subject, each one of these topics should be discussed in detail.

METHODS OF INSTRUCTION treats of the different branches of knowledge and how to teach them. It embraces three general divisions: 1. The Nature of Knowledge; 2. The Nature of Instruction; 3. The Methods of Teaching each Branch. In a full treatise upon the subject, each one of these topics should be discussed in detail.

The three divisions of these two branches of Teaching, are seen to correlate. Thus the Nature of Man in the first branch correlates with the Nature of Knowledge in the second; the Nature of Culture in the former corresponds to the Nature of Instruction in the latter; and the Method of Cultivating each Power is correlative with the Method of Teaching each Branch. As the two branches stand in the relation of the subjective and the objective, so do the corresponding divisions of the two branches.

SCHOOL ECONOMY treats of the methods of organizing and managing a school. It embraces five things: 1. School Preparation; 2. School Organization; 3. School Employments; 4. School Government; 5. School Authorities. This classification is that presented by Dr. Wickersham, and is regarded as logical and complete.

The relation of the several branches of the Science of Teaching, together with a few of their practical divisions, is expressed in the following outline:

THE SCIENCE OF TEACHING.

1. METHODS OF CULTURE.
   - Nature of Man.
   - Nature of Culture.
   - Method of Cultivating each Faculty.
2. METHODS OF INSTRUCTION.
   - Nature of Knowledge.
   - Nature of Instruction.
   - Method of Teaching each Branch.
3. SCHOOL ECONOMY.
   - School Preparation.
   - School Organization.
   - School Employments.
   - School Government.
   - School Authorities.

In this work we design to speak mainly of Methods of Instruction, but so necessary is a knowledge of the mind and the methods of training it that we shall give a single chapter to each of the three divisions of Methods of Culture; namely, The Nature of Mind, the Nature of Culture, and the Methods of Cultivating each Faculty. We shall then speak of the Nature of Knowledge and the Nature of Instruction, embracing under the latter head, Forms of Instruction, Order of Instruction, and Principles of Instruction. Having laid this foundation, we shall proceed to the consideration of the Methods of Teaching each Branch of Knowledge.

CHAPTER IV.

THE NATURE OF THE MIND.

THE MIND is that which thinks, feels, and wills. It is that immaterial principle which we call the soul, the spirit, or the intelligence. Of its essence or substance, nothing is known; we know it only by its activities and its operations. The different forms of activity which it presents, indicate different mental powers, which are called *Faculties* of the mind.

A MENTAL FACULTY is a capacity for a distinct form of mental activity. It is the mind's power of doing something, of putting forth some energy, of manifesting itself in some particular manner. The mind possesses as many faculties as there are distinct forms of mental activity. In order, therefore, to ascertain the different faculties of the mind, we must notice carefully the various ways in which the mind acts.

General Classification.—The mind embraces three general classes of faculties; the *Intellect*, the *Sensibilities*, and the *Will*. Every capacity or power which the mind possesses falls under one of these three heads. Every mental act is an act of the Intellect, the Sensibilities, or the Will.

This three-fold division of the mind is the latest teaching of philosophy. These three classes of faculties are not to be considered, however, as parts of a complex unit, but rather as forms of manifestation of the spiritual entity which we call *The Mind*. The mind is thus a tri-unity,—one substance with a trinity of powers or capacities. The doctrine of the Trinity of the Mind is thus a fundamental fact of Psychology.

The INTELLECT is the power by which we think and know. Its products are *ideas* and *thoughts*. An Idea is a mental product which may be expressed in one or more words, not forming a proposition; as, a *man*, an *animal*, etc. A Thought is a mental product consisting of the combination of two or more ideas, which when expressed in words, gives us a proposition; as, *a man is an animal.*

The SENSIBILITIES are the powers by which we feel. Their products are *emotions*, *affections*, and *desires*. An *emotion* is a simple feeling, as the emotion of joy, sorrow, etc. An *affection* is an emotion that goes out towards an object; as *love*, *hate*, *envy*, etc. A *desire* is an emotion that goes out to an object with the wish of possession; as the *desire* of *wealth*, *fame*, etc.

The WILL is the power by which we resolve to do. It is the executive power of the mind, the power by which man becomes the conscious author of an intentional act. The products of the Will are *volitions* and *voluntary actions*. It is in the domain of the Will that man becomes a moral and responsible being.

The relation of these three spheres of activity may be illustrated in a variety of ways. I read of the destitution and suffering in a great city and understand the means taken for their relief; this is an act of the intellect. I feel a deep sympathy with this suffering; my heart is touched with pity, and I experience a strong desire to aid in relieving their distress; this is an act of the sensibilities. I desire to express my feelings of pity and follow my sense of duty, and resolve to aid them by sending a contribution or going personally to their relief; this is an act of the will.

The Intellect.—The INTELLECT embraces several distinct faculties; *Perception*, *Memory*, *Imagination*, *Understanding*, and *Intuition*, or the *Reason*. This classification of the Intellect is now almost universally accepted, though writers occasionally differ in the terms they use to name the different powers.

PERCEPTION is the power by which we gain a knowledge of external objects through the senses. It is the faculty by which we gain a knowledge of objects and their qualities. Its products are ideas of external objects and of the qualities of objects. The ideas which we possess of persons, places, things, etc., are mainly given by perception.

MEMORY is the power by which we retain and recall knowledge. It enables us to hold fast to the knowledge we have acquired, and also to recall it when we wish to use it. These two offices of the Memory are distinguished as *Retention* and *Recollection.* By some writers these are regarded as separate faculties; and others again discard the element of retention. Besides these, the memory also gives us a *representation* of that which it recalls, and *recognizes* it as something of our past experience.

IMAGINATION is the power by which we form ideal conceptions. It is the power of forming mental images by uniting different parts of objects given by perception, and also of creating ideals of objects different from anything we have perceived. Thus, I can conceive of a *flying horse* by uniting my ideas of wings and a horse; or I can imagine a landscape or a strain of music different from anything I have ever seen or heard. Imagination is thus *the power of ideal creation.*

The UNDERSTANDING is the power by which we compare objects of thought and derive abstract and general ideas and truths. It is the elaborative power of the mind; it takes the materials furnished by the other faculties and works them up into new products. Its products are *abstract* and *general ideas*, *truths*, *laws*, *causes*, etc.

INTUITION, or the REASON, is the power which gives us ideas and thoughts not furnished by the senses nor elaborated by the Understanding. Its products are called *primary ideas* and *primary truths.* The Primary Ideas are such as Space, Time, Cause, Identity, the True, the Beautiful, and the Good. The Primary Truths are all self-evident truths, as the axioms of mathematics and logic.

The Understanding.—The UNDERSTANDING embraces several distinct faculties or forms of mental activity. These are *Abstraction*, *Conception*, *Judgment*, and *Reasoning*. This division is now almost universally adopted, and the same terms are employed by nearly all modern writers.

ABSTRACTION is the power of forming abstract ideas. It is the power by which the mind draws a quality away from its object, and makes of it a distinct object of thought. Its products are abstract ideas, such as *hardness*, *softness*, *color*, etc. The naming of abstract ideas gives us abstract terms. The term *Abstraction* is derived from *ab*, from, and *traho*, I draw, and signifies a drawing from.

CONCEPTION is the power of forming general ideas. By it we take several particular ideas, and unite their common properties, and thus form a general idea which embraces them all. The products of Conception are general ideas, or ideas of classes; as *horse*, *bird*, *man*, etc. The naming of general ideas gives us common terms. This faculty is often called *generalization;* but the term *Conception* is more appropriate, and is the one generally adopted by logicians. The term *Conception* is derived from *con*, together, and *capio*, I take; and signifies a taking together.

JUDGMENT is the power of perceiving the agreement or disagreement of two objects of thought. It is the power of comparison. It compares one object directly with another, and gives us a proposition. A proposition is a judgment expressed in words. Thus, *a bird is an animal*, is a judgment expressed. The term Judgment is applied to both the mental faculty and its product.

REASONING is the power of comparing two ideas through their relation to a third. It is a process of indirect or mediate comparison. It deals with three objects of thought and requires three propositions. Thus, suppose I wish to compare A and B, and perceiving no relation between them, see that A equals C, and B equals C, and thus infer that A equals B; such an inference is an act of reasoning.

The form in which reasoning is expressed is called a *Syllogism.* A Syllogism consists of three propositions so related that one of them is an inference from the other two. Two of these propositions are called the *premises* and the third the *conclusion.* Thus, in the above example the two propositions, "A equals C" and "B equals C," are the premises; and "A equals B" is the conclusion.

Reasoning is of two kinds; *Inductive Reasoning* and *Deductive Reasoning.* INDUCTIVE REASONING is the process of deriving a general truth from particular truths. Thus, if I find that heat expands several metals, as zinc, iron, copper, etc., I may infer that heat will expand *all metals.* Such an inference of a general truth from the particular facts is called *Induction.* Inductive Reasoning proceeds upon the principle that *what is true of the many is true of the whole.*

DEDUCTIVE REASONING is the process of deriving a particular truth from a general truth. Thus, from the general proposition that *heat expands all metals*, I may infer by Deduction that heat will expand any particular metal, as silver. Deduction proceeds upon the principle that *what is true of the whole is true of the parts.*

Other Forms of Mental Activity.—Besides the faculties now named, there are two other forms of mental activity, or mental states, called *Consciousness* and *Attention.* These are not regarded as specific faculties of the mind, but as conditions or accompaniments of these faculties.

Consciousness.—CONSCIOUSNESS is the power or attribute of the mind by which it knows its own states or actions. The term is derived from *con*, with, and *scio*, I know, and means a knowing with the mental acts or states. It is regarded as an attribute of the mind, involved in the very idea of mind, and not as a mental faculty. Thus, to *know* is to know we know, to *feel* is to know we feel, to *will* is to know we will. The expressions, "I know that I know," "I know that I feel," etc., are equivalent to I am conscious that I know, I am conscious that I feel, etc. Consciousness is a kind of inner light by which one knows what is going on within his mind; it is a revealer of the internal phenomena of thought, feeling, and will.

Attention.—ATTENTION is the power of directing the mind voluntarily to any object of thought to the exclusion of others. It is the power of selecting one of several objects, and concentrating the mental energies upon it. The term is derived from *ad*, to, and *tendo*, I bend, which was probably suggested by the attitude of the body in listening attentively to a sound.

Attention is not a distinct form of mental activity, but is involved in and underlies the activity of all the faculties. The voluntary operation of any of the mental powers, as Perception, Memory, etc., carries with it an act of attention. It is not the power of knowing, but of directing that which may know. It has no distinct field or province of its own, yet without it the faculties would be of little use to us. It works with them and through them, increasing their efficiency, and giving them a power they would not otherwise possess.

Conception.—The term *Conception* is often used in a general and popular sense, meaning that power which the mind has of making anything a distinct object of thought. In this sense it is intimately related to all the mental faculties. Thus I can conceive of a tree or a horse which I have seen, a landscape which I may not have seen, a proposition in geometry, a truth in natural philosophy, etc. Some writers have used the term in a more specific sense, as the power of forming an exact transcript of a past perception. In Logic the term is restricted to the power of forming general ideas, as we have previously defined it.

CHAPTER V.

THE NATURE OF CULTURE.

CULTURE, as already defined, is the developing of the powers of man. It aims at the unfolding and growth of all the powers, and the training of them so as to attain their highest activity and fullest development. As in the culture of land we aim to improve the soil, so in human culture we aim to enrich the soil of the mind and cause it to bud and blossom and bring forth its richest harvests of thought and sentiment, of science, art, and character.

Culture is usually divided into three distinct branches; Physical Culture, Intellectual Culture, and Moral and Religious Culture. Besides these there are also Social Culture, Æsthetic Culture, Spiritual Culture, etc. These are, however, but varieties or special forms of those before mentioned, which are the ones generally embraced in a scheme of education.

Physical Culture.—PHYSICAL CULTURE is that which relates to the cultivation and development of the physical powers. It embraces the culture and attainment of Health, Strength, Skill, and Beauty. A full discussion of the subject would include a consideration of the conditions, the laws, and the methods of securing each one of these objects.

The first object of physical culture is *Health.* To a large extent man's health is in his own keeping. We can be sick or well as we choose. Sickness is the penalty of violating physical law. Death, except in old age, is a curse entailed upon man by his transgressions. A proper physical culture would banish disease and premature death from the land. It would increase the average term of life from thirty-three to, at least, threescore and ten years. Physical culture seeks to ascertain the laws and methods by which these results are secured, and to present a sound body as a condition of a sound and vigorous intellect.

The second object of physical culture is *Strength*. By culture a man can double or treble his natural strength; and not transcend the limits of health. A proper physical culture would remove the bodily weakness which we find so prevalent in society. It would give muscular fibre and endurance where we now find flabbiness and debility. It would give physical power to our professional and business men, and enable them to endure much more fatigue and to accomplish much more than they can at present. It would transform the delicate and frail-looking women of to-day, who cannot go upstairs without palpitation of the heart, or see a spider without fainting or shrieking, into women of muscular power and endurance, such as were the women of Sparta, and as nature intended women to be.

The third object of physical culture is *Skill*. This is also an object worthy of attainment. To use the muscles with dexterity, either for pleasure or business, is in itself laudable. There is a merit in being a good gymnast, or a good cricketer or base ball player. To walk far, run fast, jump a good distance, etc., are not unworthy attainments. It is told to the credit of Washington that he could leap twenty-four feet on a running jump. To possess manual skill and be able to use our hands for some useful purpose is especially desirable. A knowledge of a use of tools is of great value to every person. "Every man his own carpenter" is worth as much as "every man his own lawyer." Education should therefore aim to cultivate muscular skill and dexterity.

A fourth object of physical culture is the attainment of *Beauty*. Deformity, like sickness, is the result of violated physical law. Had sin never entered Paradise, men would be as handsome as Adam, who was no doubt a model in physical proportion; and women would still be as lovely as

Eve, who was, it is believed, the perfection of womanly beauty. Let the race keep nature's laws, and we would return toward the primitive beauty fashioned by the Divine hand. Art does much to restore what we have lost; but culture is the best panacea for ugliness. The best coloring for the cheek is pure, rich blood; the best enamel for the neck and arms is the flush of health. Such beauty does not rub off nor come and go with the touch of art—" 'T is ingrain; 't will endure wind and weather."

Intellectual Culture. — INTELLECTUAL CULTURE is that which relates to the development and training of the intellectual powers. The object of intellectual culture is the normal growth and highest activity of all the intellectual faculties. A full consideration of the subject would present the laws and methods by which each susceptibility and power may be properly trained and developed. Only a few thoughts will be here presented.

Intellectual Culture aims to cultivate the powers of *Observation.* It enables man to see what is going on around him, and to acquire a knowledge of facts and phenomena. It makes him sharp-eyed and ready to drink in knowledge at every pore. It makes him an original observer of nature and society, obtaining his knowledge first hand, instead of depending on others for it. It thus gives him independence in his own ideas of things, and enables him to make contributions to the sum of human knowledge.

Intellectual Culture increases the power of the *Memory* It gives strength of retention and readiness of recollection It makes man a treasury of knowledge,—a walking library of information. It aims to overcome the habit of allowing things to fade away from the memory, and trains the mind to hold what is worth knowing as a permanent possession. It aims to bring the memory up towards the old standard of power when men could repeat volumes of manuscript, or "call by name the twenty thousand citizens of Athens."

Intellectual Culture aims to give activity and direction to the power of *Imagination.* It leads it to delight in ideal creations, to enjoy the works of fiction, to wander with pleasure among the images of poetry, to linger delighted amid the romantic events of history, to awaken into activity in viewing the varied beauties of earth, sea, and sky, and to revel among the works of art where the pencil of the painter or chisel of the sculptor has made a name immortal. It aims also to develop the creative power of artistic genius, and to stimulate those who have the gift divine to emulate the achievements of the masters in poetry, fiction, and fine art.

Intellectual Culture embraces the training of the power of *Thought.* It aims to make man a thinker, to enable him to draw true conclusions from the facts he observes, to exercise correct judgment in the affairs of life, to investigate and ascertain the laws of nature and society, to read the truths which God has written upon the pages of earth and sky, to build up the sciences and apply their principles to the advancement of truth and the improvement of the world. It aims to develop the power of thought by which man lifts himself into a higher civilization, makes the elements servants of his will to promote his comfort and happiness, arms himself with the power to predict the events of the far off future, and stands at the head of created beings, crowned with the triumphs of science and philosophy.

Æsthetic Culture.—ÆSTHETIC CULTURE embraces the cultivation of the æsthetic nature. The æsthetic nature includes the activity of the Reason and the Sensibilities as pertaining to the beautiful. The Reason apprehends beauty; the Sensibilities admire, appreciate, and enjoy it. Æsthetic culture seeks to develop this nature to the fullest appreciation of the element of beauty as found in the works of nature and art, to lift the soul upward to the enjoyment of the refined and artistic, to refine and elevate the taste, and thus add to man's happiness and lend an influence for the growth of his spiritual nature.

Moral Culture.—MORAL CULTURE embraces the training of the moral nature. The moral nature includes the activity of the entire spiritual being; it involves the activity of the Intellect, the Sensibilities and the Will. The Reason apprehends the Right and the obligation to do the Right; the Sensibilities feel the obligation to act in accordance with an apprehension of obligation; and the Will puts forth the executive volition in obedience to the spiritual imperative. The Æsthetic nature consists of idea and feeling; the Moral nature consists of idea, feeling, and will. In mathematical phraseology, the Æsthetic nature=the Reason, plus the Sensibilities; the Ethical nature=the Reason, plus the Sensibilities, plus the Will. Moral Culture embraces the full and complete development of this nature.

Religious Culture.—Religious Culture embraces the training and development of the religious nature. The religious nature is the highest form of the ethical; it is the ethical acting in relation to the Supreme Being. It implies the consecration of all our powers to God, and requires their fullest and highest activity. The highest operation of the Reason is Faith; the highest operation of the Sensibilities is Love; the highest operation of the Will is Obedience. The elements of religion, therefore, are *Faith*, *Love*, and *Obedience;* Faith in God and salvation; Love to God and man; Obedience, the complete subordination of the human will to the Divine. Here we reach the crowning excellence of man's being, the keystone of the spiritual arch. Religious culture thus aims to cultivate faith in God, love to God and man, and complete obedience to the Divine will.

CHAPTER VI.

METHODS OF CULTIVATING EACH FACULTY.

HAVING attained a knowledge of the nature of the mind and the general nature of culture, we are prepared to apply these to the training of each faculty of the mind. Only a few brief suggestions can be made; the subject would require a volume to treat it with any degree of completeness.

Perception.—The Perceptive Powers should be cultivated in early childhood. This is indicated by Nature, who gives active senses to a little child. Teachers have been entirely too neglectful of their duty in this respect. Children have not been trained to use their eyes and their other senses as they should have been. They have been taught to read the text-books of the school-room; but, to a large extent, the "book of Nature" has been a sealed volume to them.

The Perceptive Powers may be cultivated by training children to a habit of observation. The following suggestions will indicate to teachers the method of cultivating the perceptive faculty:

1. *To cultivate the Perceptive Powers, require pupils to observe things for themselves.* Bring objects into the school-room for them to see and examine. Send them out into the fields and woods to gather facts for themselves. Teach them to read the book of nature as well as the books of the school-room.

2. *To cultivate the Perceptive Powers, require pupils to describe objects.* In order to describe an object, it must be very closely observed. The attempt to describe will lead pupils to see the necessity of examining an object with attention, and will give quickness and accuracy to the perceptive powers.

3. *To cultivate the Perceptive Powers, train pupils upon a well graded system of object-lessons.* Give the pupils lessons on *form*, *color*, *size*, etc., and they will learn to notice these elements in the objects that they see. The sense of vision will thus become sharp, delicate, and accurate.

4. *Require pupils to draw outlines or sketches of objects.* In order to draw an outline of an object it is necessary to examine it very minutely. The practice of drawing will thus cultivate the habit of close and minute observation.

Such exercises will train pupils to the habit of using their perceptive powers, and habit is nearly everything in education. Teachers should also impress upon the minds of their pupils the importance of using their eyes, and not going through the world blind to its most interesting facts.

The Memory.—The Memory should be carefully trained in youth, so that it may firmly hold the knowledge acquired and readily recall it. Minds differ in natural power of memory, but much can be done to strengthen a weak or quicken a sluggish memory. A neglect of the proper use of this faculty leads to habits which weaken it, and make it slow to acquire and unreliable in recalling its knowledge.

The following suggestions will indicate to the teacher how he may cultivate the memory of his pupils:

1. *To cultivate the Memory, require pupils to attend closely to whatever subject they are considering.* Attention is a necessary condition of remembering. A heedless mind soon forgets what it sees, hears, or reads. The mind must be concentrated upon the object of thought that it may be indelibly impressed upon the memory.

2. *To cultivate the Memory, lead pupils to feel an interest in what you wish them to remember.* An interested mind is open to receive the deepest impression. An incident which excites the mind is never forgotten. A pupil who takes delight in what he is learning will have little difficulty in acquiring it, and will retain it permanently.

3. *To cultivate the Memory, we should require a frequent review or repetition of that which the pupil has learned.* Repetition seems to fix a subject more firmly in the memory. It acts like the die on a waxen tablet; every repetition seems to make the impression more durable. The subject most frequently recited is the most readily recalled, and remains the longest in the memory.

4. *To cultivate the Memory, we should require pupils to commit many extracts of prose and poetry.* This will fix words and forms of expression in the mind, and cultivate a memory for language. Practice of this kind will give great facility in committing, while a neglect of it will so enfeeble the memory that it will be almost impossible to commit anything.

5. *To cultivate the Memory, we should lead the pupils to connect their knowledge by the laws of association.* This is the way in which the memory naturally acts, and in which it acts with the most readiness and accuracy. The pupil should associate similar facts in geography, events of the same date in history, or those related as cause and effect. Such a habit will give a strong and reliable memory.

The Imagination.—The Imagination of children should be carefully cultivated. This faculty is usually very active in childhood, and needs guiding and refining. When it is sluggish, it should be excited and aroused into activity; when it is too active, it should be restrained and directed. The judicious training of this faculty will be of great value to the pupil. It will be a source of pure and refined pleasure, and will exert an elevating influence on the character.

1. *The Imagination may be cultivated by observing beautiful, grand, and picturesque scenery.* The spreading landscape, the flowing river, the wide extended ocean, the arching sky, out of whose deep blue the golden stars are shining, the moon in her beauty and the sun in his splendor—all these tend to give activity and culture to the imagination.

2. *The Imagination may be cultivated by filling the memory with beautiful pictures of natural scenery.* The beautiful objects we have seen should be brought before the mind as pictures upon which it delights to look. Each mind may thus be a gallery where pictures of beauty hang upon the walls of memory, exciting the imagination to activity and furnishing it with pure and lofty ideals.

3. *The Imagination may be cultivated by reading poetry, fiction, and other imaginative compositions.* Such productions are the embodiments of the imaginings of others, and awaken our own imaginations into activity. The figures of the poet, the characters and incidents of fiction, linger in the memory and stimulate us to create for ourselves such images of beauty and incidents of life.

4. *The Imagination may be cultivated by hearing music, visiting galleries of painting, statuary*, etc. Here we have the embodiment of imaginative beauty in color and form, which pleases and excites the fancy. That which was once in the imagination of the creator awakens a similar activity in the mind of the beholder. There is thus cultivated a pure and refined taste, and a natural and lively activity of the Imagination.

5. *The Imagination may be cultivated by creating imaginary scenes, incidents*, etc. The creative power of the Imagination is its highest office, and such exercise gives it the highest culture. The pupils can be led to create and describe ideal landscapes or incidents of human action. They may be required to write and relate imaginary or fictitious events, as allegories, parables, novelettes, etc. Poetical composition and the creating of figures of rhetoric afford valuable culture in this respect.

The Understanding.—The Understanding of children should also be carefully trained. Pupils should be taught to think, as well as to see and remember. Care should be taken that the memory be not required to do that which the understanding of the child should perform. Perhaps the greatest mistake of school work is made just at this point. There is often too much cramming, and not enough thinking in our schools.

1. *The Understanding may be cultivated by the study of thought studies, as Mental Arithmetic, Written Arithmetic, Grammar, Geometry*, etc. These studies require pupils to think, and pupils learn to think by thinking. Care should be taken that the pupils study with the understanding and not merely with the memory.

2. *The Understanding may be cultivated by working out original problems, parsing and analyzing sentences*, etc. These exercises require the pupils to employ the power of original thought. They lead the mind to compare, and the process of comparison lies at the foundation of thinking. The judgment must be exercised to apply the principles and rules, and to see the relation of the conditions of the problem or the elements of the sentence.

3. *The Understanding may be cultivated by writing compositions and trying to think out and express something new.* Such exercises bring into activity the inventive powers of the mind. They require the pupil to elaborate his knowledge, to work it up into new forms, to think out something new for himself. Writing original compositions is thus a most excellent exercise for the cultivation of thought-power.

4. *The Understanding may be cultivated by the study of the mathematical and physical sciences.* The three best studies to develop the power of thought are Mental Arithmetic, for the young student; Geometry, for students from fourteen to eighteen years; and Mental Philosophy and Logic, from eighteen years and upward. For inductive thought, the natural sciences should be studied; as Botany and Natural Philosophy. The former teaches pupils to generalize and classify; the latter to investigate the causes and laws of things.

5. *The Understanding may be cultivated by reading the*

works of the great thinkers. To follow thought, as expressed in language, will stimulate to thinking. By reading the works of Plato, Aristotle, Bacon, Hamilton, etc., the mind becomes familiar with great thoughts and is aroused to think for itself.

6. *The Understanding may be cultivated by thinking.* We learn to think by thinking, *thinking*, THINKING.

Attention.—The power of Attention should be carefully trained in childhood. It is one of the most important of the mental powers, for upon its activity depends the efficiency of each one of the specific faculties. Mental power is, to a large extent, the power of attention; and genius has been defined as "nothing but continued attention."

The following suggestions will indicate to the teacher the methods by which the power of attention can be cultivated:

1. Have pupils observe objects closely.
2. Require them always to study with close attention.
3. Read long sentences and have pupils write them.
4. Read quite long combinations in mental arithmetic, and have pupils repeat them.
5. Mathematical studies are especially valuable in cultivating the power of attention.

The following suggestions are made to aid a teacher in securing the attention of his pupils:

1. Manifest an interest in the subject you are teaching.
2. Be clear in your thought, and ready in your expression.
3. Speak in a natural tone, with variety and flexibility of voice.
4. Let the position before the class be usually a standing one.
5. Teach without a book, as far as possible.
6. Assign subjects promiscuously, when necessary.
7. Use the concrete method of instruction, when possible.
8. Vary your methods, as variety is attractive to children.
9. Determine to secure the attention at all hazards.

CHAPTER VII.

THE NATURE OF KNOWLEDGE.

IN order to give instruction skillfully, a teacher should have an idea of the general nature of the different branches of knowledge and their relations to one another. He should see clearly the elements of which the different branches are composed, the relation of these elements to the human mind, and the manner in which the sciences are developed. We shall, therefore, present a brief discussion of the Nature of Knowledge.

Common and Scientific.—All knowledge may be embraced under two general divisions, *Common Knowledge* and *Scientific Knowledge.* Common Knowledge consists of unsystematized facts, ideas, and truths. It is a knowledge possessed by the common people, and is the basis of Scientific Knowledge. Scientific Knowledge consists of facts, ideas, and truths, systematized and expressed in the form of laws and principles. It enables man to interpret the facts and phenomena of nature, to see the great laws by which the universe is governed, and to previse and predict the events of the future.

General Division of Science.—Scientific knowledge has been divided into two general branches; the Empirical Sciences and the Rational Sciences. This classification is based upon the relation of their subject matter and methods of development to the human mind.

The Empirical Sciences are those which are founded on the knowledge derived through the senses: they are developed by Generalization, Classification, and Inductive Reasoning. Geography, Botany, and Natural Philosophy are examples of the empirical sciences. The facts of these sciences are given by Perception: these facts are classified by Generalization, and their laws and causes are derived by Induction.

The Rational Sciences are those which are founded on the knowledge given by Intuition or the Reason: they are developed by Deductive Reasoning. Arithmetic, Geometry, Logic, etc., are examples of the rational sciences. The fundamental ideas and axiomatic truths of these sciences are given by Intuition, and their derived truths are obtained by Deduction.

Schemes of Classification.—There have been many attempts made to classify knowledge; but no scheme of classification has yet been presented which has been universally accepted. Comte, the celebrated positive philosopher, classifies the sciences with respect to the matter of which they are composed. His classification is as follows: Mathematics, Astronomy, Physics, Chemistry, Physiology, and Social Physics. Dr. Hill classifies the branches according to the order of their development. His classification is Mathesis, Physics, History, Psychology, and Theology. Dr. Wickersham groups the sciences together under the following heads: The Elements of Knowledge, Language, The Formal Sciences, The Empirical Sciences, The Rational Sciences, The Historical Sciences, and The Arts.

Author's Classification.—Without discussing these several schemes of classification, we shall present one which we think best suited to the training of young teachers. Knowledge may be classified into seven principal divisions: 1. Language, 2. Mathematics, 3. Physics, 4. History, 5. The Arts, 6. Psychology, 7. Theology. This classification is simple, and has the advantage of employing the names of the branches as generally used in our schools.

These general branches and their subdivisions are not always entirely distinct from one another. They often overlap one another and intrude upon one another's territory. It is impossible to draw a line, in every case, marking just where one branch ends and another begins. This is true with respect to every classification that has been attempted. The scheme here presented seems more satisfactory, for the purpose of teaching, than any that we have met.

Language.—LANGUAGE is the instrument of thought and the medium of expression. The term is derived from *lingua*, the tongue. Primarily, Language is the means of communicating knowledge: it enables one mind to transfer its thought to another mind. It is also found that language is the means by which we think, as well as the medium by which we communicate our thoughts. We cannot think to any great extent, if at all, without language; and the more perfect our language the more powerful our thought—as in algebra, arithmetic, etc. We therefore embrace these two uses of language in our definition, and define it to be the *instrument of thought* and *the medium of expression*.

Mathematics.—MATHEMATICS is the science of Quantity. The term is derived from *mathematike*, meaning science. It investigates the relations of quantity, and unfolds the truths and principles belonging to it. It is based on intuitive ideas and truths, and developed by deductive reasoning. The three principal branches are Arithmetic, Geometry, and Algebra. Arithmetic is the science of Number; Geometry is the science of Space; Algebra is a general method of investigating all kinds of quantity by means of symbols.

Physics.—PHYSICS is the science of the material world. The term is derived from *phusis*, nature. It consists of facts and phenomena, and the laws and principles which control them. It begins with the observation of facts, compares and classifies them, and ascertains the causes which give rise to them and the laws which control them. The principal branches are Geography, Natural History, Natural Philosophy, Astronomy, Chemistry, Geology, etc.

Geography treats of the facts relating to the surface of the earth, classifies them, and investigates their causes and the laws which govern them. Natural history treats of the three kingdoms of nature,—the mineral, the vegetable, and the animal,—ascertaining the nature, structure, etc., of the individual objects, and classifying them. It includes Mineralogy, Botany, and Zoölogy. Natural Philosophy treats of the facts and phenomena of nature, and ascertains their causes and the laws which govern them. It includes Mechanics, Optics, Acoustics, etc. Astronomy treats of the facts and truths relating to the heavenly bodies. Chemistry treats of the nature and properties of the elements of bodies. Geology treats of the origin, development, and structure of the earth.

History.—HISTORY is a systematic description of the past acts and condition of mankind. It embraces the Facts of History and the Philosophy of History. The Facts of History embrace the events that have occurred in the life of individuals and nations. The Philosophy of History endeavors to ascertain the causes which have contributed to produce the different changes in society and nations, and thus to predict the future condition of the race. In other words, it endeavors "to solve the problem of man's condition and destiny."

Art.—ART is the application of knowledge or power to effect some desired object. It is the outgrowth of practice, and may be defined as practice guided by principle. The Arts are divided into two general classes; the Fine Arts and the Useful Arts. The object of the Useful Arts is the attainment of the end of utility; the object of the Fine Arts is the attainment of the end of beauty. These two, though primarily distinguished, are often combined in the same production; as in the manufacture of glass and pottery ware, in architecture, engraving, etc.

Psychology.—PSYCHOLOGY is the science of the human mind. The term is derived from *psyche*, the soul. It is sometimes divided into Empirical Psychology and Rational Psychology. Empirical Psychology treats of the nature of the mind as revealed in the experience of consciousness. Rational Psychology treats of the nature of the mind as determined by the necessary principles given by the Reason.

Theology.—THEOLOGY is the science which treats of God. The term is from *Theos*, God, and *logos*, a discourse. It has been divided into Natural Theology and Revealed Theology. Natural Theology endeavors to ascertain the nature of God through his works, by the light of philosophy and reason. Revealed Theology seeks a knowledge of the Divine Being through his revealed word.

Other Distinctions.—It is often convenient to speak of the *Inductive* and the *Deductive* Sciences. The former include all those branches of knowledge which begin in facts and are developed by generalization and inductive reasoning; as geography, botany, natural philosophy, etc. The latter include all those branches of knowledge which begin in ideas, and are developed by the process of deductive reasoning; as arithmetic, geometry, etc. A division of the Rational Sciences is often made, called the *Formal Sciences.* The Formal Sciences may be defined to be those sciences which treat of the necessary forms in which truth presents itself. They include Mathematics and Logic; Mathematics treating of the form in which quantity is presented, and Logic of the form in which thought presents itself.

NOTE.—In respect to Geography, it should be stated that it is not a distinct science, but a combination of several sciences. Thus in its higher departments, it embraces the elements of Astronomy, Natural Philosophy, and Geology; while that which relates to man and his works is historical in its nature. Some writers in view of the latter fact class it among the historical sciences. Political Geography seems to belong to History, and Physical Geography to the Physical Sciences; and it may be classed therefore in either of these two divisions of knowledge.

CHAPTER VIII.

THE FORMS OF INSTRUCTION.

INSTRUCTION, as previously defined, is the art of furnishing the mind with knowledge. It is the art of developing knowledge in the mind of another. By it we are enabled to build up in the mind of the learner a knowledge of the sciences, as an architect erects a building. Under the direction of a teacher, a science is developed in the mind in symmetry and beauty as a temple is erected under the guiding genius of a skillful architect.

Knowledge may be developed in the mind in different ways; these different ways we call *Forms of Instruction.* There is a certain order in which knowledge should be developed in the mind; this order we call the *Order of Instruction.* There are certain laws which should guide a teacher in developing knowledge; these laws we call the *Principles of Instruction.* In discussing the Nature of Instruction we shall speak of the Forms of Instruction, the Order of Instruction, and the Principles of Instruction.

The *Forms of Instruction* are the various ways in which we may develop knowledge. The principal Forms of Instruction are the *Analytic* and *Synthetic*, the *Concrete* and *Abstract*, the *Inductive* and *Deductive*, the *Theoretical* and *Practical.* We will define and illustrate each one of these forms.

Analytic and Synthetic.—*Analytic Instruction* is that form of teaching which proceeds from wholes to parts. Thus, if I take a watch and separate it into its parts, and teach the name and office of each part as I take it to pieces, the process is analytic. So in grammar, if I begin with the sentence and separate it into its parts, I am using the analytic process. If in geography we begin with the globe as a whole, and separate it into land and water, and come down from continents and oceans to the smaller divisions, the process is analytic.

Synthetic Instruction is that form of instruction which proceeds from parts to wholes. Thus, if we take the parts of a watch as separated, and putting them together, teach the name and use of each part, we are teaching synthetically. If in grammar we begin with the words as parts of speech, and put them together to form sentences, we are teaching by the synthetic method. So if we begin with the geography of the school grounds, go out to that of the township, the county, and the state, and thus at last cover the entire surface of the earth, the method is synthetic.

Concrete and Abstract.—*Concrete Instruction* is that form of teaching which employs objects and illustrations. Thus, object lessons, or the use of pictures and diagrams, are examples of concrete instruction. In Arithmetic, the teaching of the fundamental operations by means of the numeral frame, of fractions by means of illustrations, of denominate numbers by means of the actual measures, of banking by establishing a bank in the school, are examples of concrete instruction. Grammar taught from language, rather than from the rules of the text-book, is also concrete teaching.

Abstract Instruction is that form of teaching which does not employ objects and illustrations. In Arithmetic, counting, addition, etc., taught without any objects or illustrations, denominate numbers by merely repeating the tables, percentage by the definitions and rules without illustrating the actual business transactions, etc., are examples of abstract instruction. Grammar taught from the definitions of the text-books, instead of from language in which we find the principles embodied, is abstract instruction. Teaching Geography from the book, rather than from natural objects, is an example of abstract instruction.

Inductive and Deductive.—*Inductive Instruction* is that form of teaching which proceeds from particulars to generals.

The leading of pupils by appropriate questions and examples to the apprehension of an idea or principle before it is stated, is a process of inductive teaching. Thus, in Arithmetic, if by presenting particular examples we lead the pupil to see the principle or rule before stating it, we teach inductively. If in Geometry, by appropriate examples, we lead the pupil to a geometrical idea or principle, and then require him to express it, we are teaching inductively. In Grammar, teaching inductively, we would lead a pupil to the idea of a part of speech before we named and defined it; or lead him, as we often can, to the name of a part of speech, without his learning it from a book or the teacher.

Deductive Instruction is that form of teaching which proceeds from generals to particulars. If we first state the general principle and then lead to the particular applications of it, we are teaching deductively. Thus, in Arithmetic, we may teach the pupil the principles of fractions, and then have him apply them; or in Grammar we may teach the words of a definition, and then illustrate its meaning: in both cases we are teaching deductively. Deriving ideas from definitions, methods from principles, particular methods from general laws, are all deductive methods of procedure.

The Inductive and Deductive methods may be distinguished even in stating definitions. Definitions may be stated either in an inductive or a deductive form. If we begin with the term to be defined and pass to its explanation, the form is deductive; but if we begin by giving the idea, and end by naming the term, the form is inductive. Thus "Addition is the process of finding the sum of two or more numbers," is in the deductive form; and "The process of finding the sum of two or more numbers is called Addition," is in the inductive form of stating a definition.

Theoretical and Practical.—*Theoretical Instruction* is that form of teaching which deals principally with the laws and principles of a subject. Teaching the theory of arithmetic without making an application of it to practical problems, is an example of theoretical teaching. The so-called practical problems of arithmetic, are sometimes purely theoretical, never occurring in actual life. Teaching the definitions and principles of grammar without applying them—a fault not uncommon—is also an illustration of theoretical instruction. The teaching of geometry without any application of its principles to practical problems, a very common fault, is also an example of theoretical instruction.

Practical Instruction is that form of teaching which deals principally with the application of the laws and principles of a subject. When pupils are required to apply the principles of arithmetic to actual problems, and the students of grammar are taught to use the principles of language in their own speech and writing, we have an illustration of practical teaching. To open a counting-house in the school-room and show by actual transactions what the business problems of arithmetic mean, is practical instruction. The application of the principles of geometry to actual problems that may occur to a business man, and also to surveying and engineering, furnishes an example of practical instruction.

Application.—Several of these forms may be used in teaching the same subject; and sometimes one form is preferable and sometimes another. The concrete and inductive forms should be used with children; the abstract and deductive forms are more suitable to older pupils. Analysis and synthesis are often employed in teaching the same subject; though, as a rule, the analytic form should precede the synthetic. All instruction should be practical, though at certain stages the abstract element may predominate. It is not our purpose to point out the use of these forms here, but merely to make the pupil familiar with the forms themselves. Their use and special application will be indicated in the chapter on the Principles of Instruction, and in the methods of teaching the particular branches of study.

CHAPTER IX.

THE ORDER OF INSTRUCTION.

THE school-time of life has been divided into four periods; Infancy, Childhood, Youth, and Manhood. Infancy embraces the period from the birth of the child to the age of five years; Childhood, the period from five to ten years; Youth, the period from ten to sixteen years; and Manhood, the period from sixteen to twenty-one years.

These are not definitely fixed periods, as some persons mature very much earlier than others. Girls from twelve to sixteen years of age are usually much more mature than boys of the same age. The distinctions are sufficiently definite, however, for the purpose in view. The inquiry is, What is an appropriate course of study for each one of these periods? How much of the several branches—Language, Mathematics, Physics, History, the Arts, etc., shall be taught in each one of these periods?

Several writers treat of this subject under the head of a Graded Course of Study, in which they attempt to fix the kind and amount of knowledge suitable for the various grades of a public school. Dr. Hill, who has a very complete discussion of the subject, divides the school time into five distinct grades; the first, or Sub-primary school, from five to eight; the second or Primary school, from eight to eleven; the third, or Grammar school, from eleven to fourteen; the fourth, or High school, from fourteen to seventeen; and the fifth, or College period, from seventeen to twenty-one. This is practical; but as grades in different places vary, it has been thought best to discuss the subject in general under the four heads named, as is done by Dr. Wickersham in his *Methods of In-*

struction. Any teacher who understands the order presented will have no difficulty in arranging the studies of a graded school.

Infancy.—During this period a child learns to talk. It may also learn a few written words, and the letters of the alphabet. In Mathematics, it may learn some of the figures of geometry, to count as far as twenty-five or fifty, and perhaps to add and subtract a few of the smaller numbers with objects. It will acquire a large number of facts in botany and zoölogy, and also many of the elementary facts and phenomena of natural philosophy. It may also become familiar with a few facts of history, learn to sing little songs, and to use a pencil and draw a little. This instruction should be given at home or in a kindergarten.

Childhood.—During childhood, the child should learn to read, to spell, to pronounce correctly, and to express itself with considerable correctness and facility, both in speaking and in writing. It should receive a systematic course of instruction in Language Lessons, including orthography, the construction of sentences, the use of capitals, punctuation marks, etc. There should not, however, be any formal instruction in Grammar. If circumstances will permit, the child may learn to speak one or two modern languages, and even elementary instruction in Latin could be given.

Instruction in Arithmetic should embrace numeration and notation,—the naming, writing, and reading of numbers; the fundamental operations of addition, subtraction, multiplication, and division; the elements of common fractions, decimals, and denominate numbers. In Geometry, he should become familiar with all the ordinary figures, both plane and solid; learn to construct and point out their different parts and elements; and perhaps learn a few of the elementary truths of the science.

In the facts of the Physical Sciences, his course should be quite extensive. He should become familiar with the leading facts of descriptive geography, and be able to locate the principal countries, cities, rivers, mountains, etc., of the world. In Botany, he should become familiar with the ordinary trees of his neighborhood, the principal flowers of the garden and meadows, be able to name many of the forms of leaves and corollas, etc. He should also learn the names of the principal animals, domestic and wild; many of the ordinary insects, and some of the more common fishes. He should also learn the common minerals of the neighborhood; as quartz, limestone, sandstone, granite, etc. Many of the simple facts and phenomena of Natural Philosophy, and the causes of the same, may also be learned, and some of the simpler experiments of the science may be presented to him.

During this period a child can learn, by oral instruction, many of the leading facts of the History of the world, and of his own country. He is able also to read works on biography and history, if written in a simple and interesting style, and should be encouraged to do so. In the Arts, he should be taught to write, to draw, and to sing; and if he has any musical taste, may begin to learn to play some instrument. Boys should learn the use of a knife and other tools, and girls the use of the needle, scissors, etc.

Youth.—During the period of youth, the pupil should continue the study of Language, increasing his vocabulary and acquiring skill in the use of his mother tongue. He should have a careful drill in orthography, pronunciation, and reading. He should also begin the study of grammar and the elements of rhetoric, learn to use the dictionary, and have constant exercises in composition writing. He should be required to read, commit, and recite choice extracts of prose and poetry for the cultivation of a literary taste. He should also begin the study of Latin and Greek, and perhaps one or two foreign languages. An extensive course of reading in poetry and prose would also be of advantage.

In Mathematics, he should go through an ordinary text-book on mental and written arithmetic; begin and in many cases complete an elementary work on algebra; and if he has had a good opportunity for mathematical study, should complete an elementary text-book on geometry. Of the Physical Sciences, he should continue his course in descriptive geography, and also study physiology, botany, natural philosophy, astronomy, and physical geography. During this period he can complete the elements of these branches as they are presented in the ordinary elementary text-books. Some of the elements of zoölogy and mineralogy should also be included in the course of studies arranged for pupils from ten to sixteen years of age.

During this period he may complete the ordinary text-book on the history of his own country, and even a small text-book on general history. He should also read such works as the Rollo Books, Abbott's Histories, and other works of biography, travels, voyages, and explorations. The historical stories of Miss Yonge and Miss Strickland are especially recommended to pupils of ten or twelve years of age.

In respect to the Arts, the pupil should learn, during this period, to write a good hand, to draw with considerable skill, to read music by note, to sing, and if he has musical talent, to play one or two instruments. Girls should learn to sew, mend, darn, cut and fit garments, and receive instruction in housekeeping, cooking, etc. Boys should become familiar with the use of tools, and acquire some of the elements of the mechanic arts. If there is special talent for the mechanic or fine arts, an opportunity should be afforded for additional culture in these branches.

Some of the elements of Mental and Moral Philosophy might be learned during this period, but it is thought that any formal study of these branches should be usually postponed until after the age of sixteen.

Manhood.—During this period the Language studies of the previous period should be continued into their higher departments; in addition to which there should be a thorough course in Rhetoric, General Literature, Philology, etc. There should also be an extensive course of general reading of the poets and prose writers, and a close and careful study of some of them as models of style and expression. There should also be much practice in composition, and the pupil should become a good writer and speaker.

The Mathematical studies of this period should include higher arithmetic, higher algebra, higher geometry, trigonometry and surveying, analytical geometry, differential and integral calculus, and the philosophy of mathematics. If there is time, some of the recently developed branches of the science may also be studied; and the pupil should be encouraged to push his investigations beyond any of the ordinary text-books on the subject.

The course in Natural Science should include a higher course in Natural Philosophy, embracing mechanics, optics, acoustics, etc.; a course in theoretical and practical Astronomy; a full course in Chemistry, Anatomy, and Physiology; and, if possible, quite a thorough course in Natural History. The student should also begin the investigation of the facts and phenomena of the material world for himself.

The course in History should include the reading and study of a complete history of one's own country, a complete course in general history, a careful reading of the detailed history of England, France, Germany, Spain, etc., a study of the works on the philosophy of history, as Guizot, Buckle, Draper, etc. The effort should be to fix permanently in the mind all the great and leading events of history, and to learn the causes which have contributed to the rise and fall of empires and nations, and thus to learn the laws which control the growth of civilization.

The course in the Arts may be continued for a year or two, according to the taste and circumstances of the pupil. Girls may continue lessons in the household arts, and boys may acquire considerable skill in working in wood and iron. When there is musical taste, it may include the culture of the voice, singing, instrumental music, thorough-bass, musical composition, etc.

When there is taste in drawing, it may include sketching from nature, perspective drawing, painting, etc., and the history and philosophy of art. Instruction in moulding figures out of clay or plaster will be valuable to both boys and girls. A course in Architecture and Landscape Gardening will also be of interest and value to the student if there are taste and time for it.

The student is now prepared for what are called the Metaphysical studies. During this period, he should take a course in Mental Philosophy, Moral Philosophy, Logic, Political Economy, Æsthetics, International Law, and the Evidences of Natural and Revealed Religion. The works of the great thinkers, Plato, Aristotle, Bacon, Locke, Kant, Hegel, Fichte, Hamilton, and the writers on the relation of modern science to philosophy and religion, may be studied. Many of these studies, however, can be merely begun at the age of twenty-one, and should be continued through life.

The course suggested will be found to be just a little in advance of the capacity of the average boy and girl, as we find them in our families and schools; but if the pupil have a careful systematic training from the beginning, he will be prepared for the studies named. The object is to present an ideal of what the course should be, and of what we should aim to make it.

CHAPTER X.

THE PRINCIPLES OF INSTRUCTION.

THE PRINCIPLES OF INSTRUCTION are the laws which guide the teacher in imparting instruction. These principles are derived from three distinct sources; the Nature of the Mind, the Nature of Knowledge, and the Nature of Instruction. The principles derived from the nature of the mind have reference to the proper culture of the mental faculties; those derived from the nature of knowledge have reference to the order in which knowledge shall be presented to the mind; and those derived from the nature of instruction have reference to the manner in which knowledge shall be taught. We shall present ten principles of each class, which may be called the *Teacher's Decalogue.*

PRINCIPLES DERIVED FROM THE NATURE OF MIND.

The following ten principles are derived from the nature of the mind, and indicate the laws which should govern the teacher in imparting instruction so that the mind may be properly trained and developed:

1. *The primary object of teaching is to afford culture.* In education culture is more valuable than knowledge. Culture gives the power to acquire knowledge, and this is worth more to the pupil than the knowledge he has already acquired. Culture also gives one the power to originate knowledge, to invent new ideas and thoughts. Without culture the mind is a mere receptacle of ideas and thoughts; with it the mind is an active energy that can transform its knowledge into new products. Knowledge makes a learned man; culture makes a wise man; and wisdom is better than learning. This primary object of teaching should never be

forgotten. The teacher should carry in his mind a clear conception of the faculties of his pupils, and keep constantly before him the thought whether his work is adapted to the growth and culture of these faculties. He should know the relation of each branch of study to the minds of his pupils, see clearly what faculties are brought into activity by it, and be sure that his work is giving, not merely knowledge, but intellectual power. In other words, he should measure his work, not merely by the knowledge he is imparting, but by the mental power he is cultivating. The neglect of this duty has warped and stunted many a young mind.

2. *Exercise is the great law of culture.* This law is universal, applying to both mind and matter. A muscle grows strong by exercise. The arm of the blacksmith and the leg of the pedestrian acquire size and power by use. So every faculty of the mind is developed by its proper use and exercise. The power of perception grows by perceiving, the power of memory by remembering, the power of thought by thinking, etc. Hang the arm in a sling and the muscle becomes flabby and almost powerless; let the mind remain inactive and it acquires a mental flabbiness that unfits it for any severe or prolonged activity. An idle mind loses its tone and strength, like an unused arm; the mental powers go to rust through idleness and inaction.

3. *The teacher should aim to give careful culture to the perceptive powers of the child.* The perceptive powers are the most active in childhood. Mental activity begins in the senses. A little child almost lives in its eyes and ears and fingers; it delights to see and hear and feel. Its eyes are sharp, its ears are quick, and its fingers so busy as to be continually in what people call "mischief." The teacher should direct this activity, and give the child food for the senses. He should provide objects for its instruction, and give it facts to satisfy this craving mental appetite, rather than attempt to feed it upon abstract ideas and thoughts for which it has no taste or capacity.

4. *The teacher should aim to furnish the memory of the child with facts and words.* The memory of children is especially strong for facts and words. Every object of nature comes through the senses with such a freshness to the mind that it stamps itself indelibly on the memory. Facts seem to stick as naturally to the young mind, as burrs to the dress. Its memory for words is no less remarkable than its memory of things. A new word, once heard, is usually a permanent possession. A child will learn to speak three or four languages in a year, if it has the opportunity of doing so. The teacher should remember these facts, and conform his work to them. He should give the child an opportunity to furnish its mind with the facts of nature and science, and also to add to its stock of words and acquire a rich and copious vocabulary.

5. *The memory should be trained to operate by the laws of association and suggestion.* The mind in retaining and recalling knowledge works in accordance with a certain law of mental operation. It ties its facts together by the thread of association, or arranges them in clusters like the grapes of a bunch. This tendency is called the *Law of Association*. The principal laws of association are the law of *Similars*, the law of *Contrast*, the law of *Cause and Effect*, and the law of *Contiguity in Time and Place*. The teacher should understand these laws and require the pupil to link his knowledge together by means of them. In geography he should have pupils associate similar facts in respect to cities, states, etc.; in history he should require them to make use of the law of contiguity in time and place, and lead them to associate events as related by cause and effect. All the knowledge taught should be so systematized that it may be readily recalled by the law of logical or topical relations.

6. *The power of forming ideal creations should be carefully cultivated.* The faculty of ideal creation is the Imagination. This power is awakened into action through the medium of perception. The facts of the senses touch the fancy, and

arouse it into activity. The forms and colors of nature, the arching sky and the spreading landscape, linger in the memory as forms of beauty, and excite the imagination to modify and create such forms for itself. This tendency is sometimes so strong, that fact and fancy become so interwoven in the mind of a child that it is difficult to discriminate between them. The teacher should encourage the activity of this faculty, and train it to a healthy and normal development.

7. *The mind should be gradually led from concrete to abstract ideas.* The young mind begins with the concrete, with objects and their qualities. Its first ideas are perceptions of objects, of things that it can see and hear and feel. Its ideas of quality are not abstracted from, but rather associated with, objects. These concrete qualities it begins to conceive independently of the objects in which they are found, and thus it gradually rises to abstract ideas. From hard objects it gets its ideas of hardness, from kind parents and friends it obtains its notion of kindness, etc. This natural tendency should be noticed and aided, so far as possible, by the teacher. Especially should he be careful not to lift the pupil up into abstractions too soon. He should present concrete examples of that which he is teaching, that the pupil may have a definite idea of the subject to be presented before he attempts to consider it abstractly. He should aid the child to rise from things to thoughts.

8. *A child should be gradually led from particular ideas to general ideas.* The young mind begins with the particular. Its first idea is of particular objects, not of general notions. A *man*, to the young mind, is a particular person; a *bird* is a particular bird. Gradually it rises from the particular object to the general conception, from a percept to a concept. The teacher should watch this natural tendency and aid it. The process should not be forced, it should not be attempted too early; but when the pupil is ready, he can gradually be lifted up from the concrete into the sphere of abstract and general

conceptions. It should be the special aim of the teacher to aid the mind in rising from the particular to the general.

9. *A child should be taught to reason first inductively and then deductively.* The child's first thoughts are the facts of sense. From these particular facts it gradually rises to general truths. By and by, after the mind has attained to some general principles through Induction, it begins to reverse the process and infer particular truths from such general principles. It also begins to apply the self-evident truths to reaching conclusions that grow out of them. This natural activity of the mind should be understood by the teacher, and the work of instruction be done accordingly. Especial care should be taken not to require deductive thought too early. In all things the law of nature should be implicitly followed.

10. *A child should be gradually led to attain clear conceptions of the intuitive ideas and truths.* Mental life begins in the senses; the child's first ideas and truths are those which relate to the material world. But, by and by, intuition awakens into activity, and in it begin to dawn the ideas and truths of the Reason. The teacher should watch this natural activity, and be governed by it. He may aid the child in developing the ideas of Space, Time, Cause, the True, the Beautiful, and the Good, by presenting suitable occasions. He may also aid the pupil in reaching the self-evident truths which spring out of these several ideas, by particular examples and suitable questions. Some of the axioms of number and space are quite early awakened in the mind; and the teacher can aid their development.

Principles Derived from the Nature of Knowledge.

The principles of the first class are drawn from a consideration of the nature of the mind. The principles of the second class are derived from the consideration of the nature of knowledge. The following ten principles are regarded as among the most important:

1. *The second object of teaching is to impart knowledge.* A person should not only know how to obtain knowledge, but he should possess knowledge. He should not only know how to use his memory in acquiring knowledge, but he should have it stored with interesting and useful facts. He should not only know how to think, but his mind should be filled with facts and truths both as the materials for and the results of thought. Though culture, which trains to the use of the faculties, may be better than learning, learning is very much better than ignorance. The teacher should therefore aim to fill the minds of his pupils with the facts of history, geography, natural science, etc. He should hold up before them a high ideal of scholarship, and create in them an ambition for wide and extensive learning.

2. *Things should be taught before words.* This principle is in accordance with the natural development of knowledge. The object existed and was known before a name was given to it; the word was introduced to designate the object. This natural order in the genesis of knowledge should be followed in the imparting of knowledge. The principle is also in accord with the natural laws of mental development.

This principle is very frequently disregarded by the teacher. It is violated by requiring pupils to commit words without definite ideas of their meaning, and to repeat definitions without understanding them. Such a course is most pernicious in its influence on the mind. It leads the pupil to acquire wrong habits of thought, to be satisfied with the expression without a knowledge of the idea or fact expressed; and deludes him with the idea that words, the symbols, are the realities of knowledge.

3. *Ideas should be taught before truths.* This law is also in accordance with the natural law of acquisition and mental development. The mind has ideas before it puts them together in judgments or thoughts. Thus it has an idea of a *chair* and the *floor* before it thinks the *chair is on the floor*

So in science, as in arithmetic and geometry, the ideas presented in the definitions are learned before the truths which pertain to them. This principle is also manifest from the nature of the mind. Ideas are given by perception and conception; thoughts are the result of judgment and reasoning; and the acts of perception and conception precede those of judgment and reasoning. This order should be followed in instruction. The effort of the teacher should be to fill the mind of the pupil with ideas, both concrete and abstract, and subsequently to teach the truths which belong to them.

4. *Particular ideas should be taught before general ideas.* This principle is in accordance with the genesis of knowledge and the natural activity of the mind. Our first ideas are of particular objects, derived through the senses; following these come the abstract and general notions given by the understanding. Thus a child has an idea of a particular *bird* before it can conceive of a *bird* in general, or of a *class* of birds; and the same is true of other notions. This order, frequently violated in education, should be carefully followed. To depart from it is to invert the law of mental activity and injure the mind, as well as retard the acquisition of knowledge. The motto should be,—*from the particular notion or idea to the general.*

5. *Facts, or particular truths, should be taught before principles, or general truths.* A fact is a truth in the domain of sense; a principle is a truth in the domain of thought. The former is concrete; the latter is abstract; and the concrete should be taught before the abstract. The former results from an operation of perception and judgment; the latter from an act of reasoning; and an act of perception precedes an act of reasoning. Again, facts are particular truths; principles are general truths; and the particular should precede the general. The principles in natural science are a generalization from facts; and the mind must be familiar with the facts before it can generalize from them. It is thus clear that facts, or par-

ticular truths, should be taught before principles, or general truths.

6. *In the physical sciences causes should be taught before laws.* In the physical sciences we proceed from facts and phenomena to the laws and causes relating to them. In presenting these, the law of mental growth indicates that we should teach the causes of things before presenting their laws. The idea of cause is very early awakened in the mind. One of the first questions of a little child is, "Mamma, what makes that?" The ascertaining of the laws which control facts and phenomena is a later consideration. The same conclusion appears from the genesis of knowledge. The causes of physical phenomena were sought for long before an inquiry was made for their laws. The ancients early made inquiries after the causes in natural philosophy and astronomy; the attempt to ascertain the laws is of much more recent date. Besides, too, the law often flows from a correct idea of the cause, as in gravitation, optics, etc. It is thus clear that in teaching the physical sciences. the causes of facts should be considered before their laws.

7. *In the physical sciences, causes and laws should be taught before the scientific classifications.* This is indicated by the law of mental growth, and also by the genesis of the sciences. The mind grasps facts, causes, and laws, before it is ready for the grand generalizations of Natural History. These latter require a knowledge of particulars and a breadth of conception entirely beyond the grasp of the young mind. The order of development of these sciences also indicates the same law. The scientific classifications of Natural History are much more recent than the facts and principles of Natural Philosophy, Astronomy, etc.

8. *The elements of the Inductive Sciences should precede the Deductive Sciences.* The elements of the Inductive Sciences are facts and phenomena; from these we proceed by inductive reasoning to laws, causes, and systems of classification. These

facts and phenomena are acquired by perception, and may thus be early presented to the learner. They come naturally into the mind before the ideas of the Deductive Sciences, and should therefore be taught before them. It is only the elements of these sciences, however, that should precede the deductive sciences. The reasoning of the inductive sciences, by which we attain the laws, causes, etc., is more difficult than the first steps of reasoning in the deductive sciences; and should not, except in its simplest form, be taught so early.

9. *The formal study of the Deductive Sciences should precede that of the Inductive Sciences.* This order arises from the nature of knowledge in its relation to the mind. Though the elementary facts of the inductive sciences present themselves to the mind as early as the elementary ideas of the deductive sciences, yet the first steps of formal reasoning in the deductive sciences are simpler than those of the inductive sciences. Thus, the acts of judgment in Mental Arithmetic, and the syllogisms of Geometry, are much more readily grasped by the young mind than the generalizations of Botany, or the investigations of Natural Philosophy.

Besides, the reasoning in the mathematical sciences trains the mind to see the relation of premise and conclusion, and gives it the habit of logical activity. A mind brought up on facts, without the training of arithmetic and geometry, will be weak and illogical in its operations, and, as a rule, incompetent for profound thinking. The fact that mathematics and logic were developed before the natural sciences also indicates the correctness of this principle. The fact, also, that many of the physical sciences, as Natural Philosophy and Astronomy, cannot be developed without the aid of mathematics, makes the order stated in the principle a practical necessity in respect to those branches.

10. *The Metaphysical Sciences should be the last in a course of instruction.* The term *metaphysical* is here used in a

general sense, to include Psychology, Logic, Ethics, Æsthetics, etc. These branches are the most abstract in their nature, and require the most maturity of thought for their comprehension. They are the product of profound reflection and of that ripeness of wisdom which comes with the maturity of age and study; and as such should not be entered upon until the pupil has attained considerable maturity of mind and culture.

Principles Derived from the Nature of Instruction.

The first and second classes of principles are drawn from the first and second elements of the problem of education,—the nature of mind and the nature of knowledge. The third class is derived from the third element of this problem,—the nature of instruction. We give the following ten principles as among the most important:

1. *Primary Instruction should proceed from the known to the unknown.* A pupil should begin to learn the new just where his knowledge of the old ends. He should be led to understand the new by seeing its relation to the old, and, if possible, its method of development from it. The known should be the stepping-stone to the unknown. What the child knows should be the light in which he is to see and understand that which he is to know. The elements of even the higher branches should be taught in this way. Algebra should begin in arithmetic, analytical geometry in algebra and geometry, etc. This principle was first announced by Aristotle, and is one of the most important in the science of teaching.

2. *Advanced Instruction may sometimes proceed from the unknown to the known.* A pupil may sometimes fix in his memory what he does not understand, and afterward obtain a clear idea of it. A definition may sometimes be committed to memory before its meaning is understood. An unknown hypothesis is often assumed in an investigation, from which

we trace our way to known facts. A law, or method of operation, whose relation to the known is not at present understood, may be accepted as correct, with the expectation that the future will make it clear to the mind. It is in this manner we reason in algebra by tracing our way from the unknown to the known; and the same method is sometimes used in geometry. We should, therefore, sometimes, in teaching and in study, proceed from the unknown to the known.

3. *Primary Instruction should be given in the concrete.* All primary instruction should begin in the concrete. Knowledge at first must pass through the senses into the mind. The child must go from things to ideas and thoughts. The child's first lesson in numbers should be given with objects. The measures of denominate numbers should be presented so that when pupils talk of gills, pints, etc., they may have definite ideas of them. The things defined in geography — capes, bays, isthmuses, etc.—should be learned through pictures or by means of some tangible representation of them. The elementary ideas of geometry are to be taught by diagrams and models, and the truth should be presented at first by concrete illustrations. From these concrete ideas the pupils can gradually pass to the higher abstractions of the several sciences.

4. *Advanced Instruction should be more abstract.* The mind at first uses the concrete thing to aid it in rising to the abstract thought. At first it hobbles along, as it were, on the crutches of sense; but at last its wings become plumed, and it can soar unaided in the higher atmosphere of abstraction. The concrete is then no longer needed; the thought is grasped without the illustration or representative object. Concrete instruction should therefore not be continued too long. To depend always upon the thing for the thought will be to weaken the mind and lower its appreciation of the pure ideas of science. To teach moral philosophy with apples and potatoes is a degradation of truth, as well as a source of weakness in mental

culture. The mind grows strong in its wrestling with and its grasp of the principles of abstract truth.

5. *Primary Instruction should be both analytic and synthetic.* Some subjects should be presented analytically and others synthetically; and in many subjects, both methods should be combined. In teaching reading, we begin with words, then unite these into sentences, and afterward analyze them into their letters. Pronunciation also proceeds by analysis and synthesis; first a synthesis of the sounds in the word, then the analysis of the word into its elements, and then again the synthesis of he elements into words. Grammar should be taught first synthetically and then analytically, and then the two methods should be united. In geography we would begin with the elements found in and around the school-house, pass out to the fields and farms, the map of the township, etc., which is synthetic; and then subsequently begin at the world as a whole, and come down by analysis to the details of the subject. In primary arithmetic we begin with synthesis, but in a short time we begin to reverse the process and proceed also by analysis. Thus addition precedes subtraction, multi plication comes before division, etc.; and an arithmetical solution contains both analysis and synthesis.

6. *Advanced Instruction should be both analytic and synthetic.* Some of the advanced studies should be presented analytically and some synthetically; and often the two are united in different degrees in different parts of the same study. In one class of studies, analysis seems to precede and synthesis to follow; in another class, this order is reversed. In the natural sciences, the pupil should be led to analyze for the elements, and afterwards to synthetize these into the science: facts are to be put together into classes, and phenomena to be combined so as to reach their laws and causes. In the mathematical sciences, the lower stage seems more synthetic, and the higher stage more analytic: the advance is from arithmetic to algebra, from the ordinary synthetic

geometry to the higher analytical geometry, from plane trigonometry to analytical trigonometry, from synthetic mechanics to analytical mechanics, etc. The tendency of all the higher studies is towards the analytical methods of thought and investigation.

7. *Primary Instruction should be inductive.* Little children should be led from particulars to generals. They should proceed from special examples to general rules or laws which embrace them. In arithmetic, they should learn particular solutions before they learn a general rule; and be required also to derive the general rules from the solution of particular cases. In grammar they should learn the general laws of speech by first seeing them presented in particular instances. In geography they should know the detailed facts before they begin to generalize them into classes and inquire after their laws and causes. So in learning the definitions of any branch, pupils should be familiar with the idea to be defined before they attempt to express it in a definition. Definitions when stated in the inductive form are more appropriate to young pupils, than when presented in the deductive form.

8. *Advanced Instruction should be deductive.* With advanced pupils the deductive method is preferred. They should be taught to reason from general principles. They should be required to grasp general laws of a subject and apply them to particular cases. In mathematics, the demonstrative method of reasoning should be employed. Thus, in fractions, the rules for all the various cases may be derived from the principles of fractions. In geography, the classification of the facts should be learned, and their causes and laws explained, as we have them treated in Physical Geography. The fundamental principles of grammar are to be understood, and to be applied in correcting and constructing language. In higher mathematics, we should proceed from the comprehending principle to the truths contained in it. La Grange, in his great work on mechanics, puts the whole doctrine of

the physical universe into an equation, and unfolds the science of mechanics by a discussion of this equation; and this is the spirit of the modern system of mathematics.

9. *Primary Instruction should proceed from the practical to the theoretical.* Young pupils should be drilled in doing rather than in thinking. In arithmetic, they should have abundant practice, and, at first, but little theory: they should be drilled in doing the work, and not in explaining it. In reading, the drill should be in the art of expression, rather than on the principles of elocution. In grammar, the primary object should be to teach pupils to use correct language, rather than to understand the principles of grammatical construction. The practice of rhetoric should precede its study as a science. The pupil should know how to think before he studies logic, the science of thought. From a correct practice in these branches they can be led to the laws which govern this practice.

10. *Advanced Instruction should proceed from the theoretical to the practical.* While younger pupils depend on imitation for their practice, advanced pupils should be required to derive their practice from principles. They will thus see the reason for their practice, and be able to direct it independently of the teacher or text-book. In arithmetic, they should be required to give a reason for the method used, and present a logical explanation of their work. In grammar, the principles which govern the construction of a sentence should be clearly understood, and the pupil should endeavor to guide his practice by these theoretical principles. In algebra, there should be a discussion of the theoretical principles of the science, as well as a solution of problems; and the science of geometry should precede the practice of surveying. A mind educated only in practice will never know anything but practice; a mind familiar with principles can originate and direct his practice as the circumstances may require.

PART II.

TEACHING THE BRANCHES.

I. OBJECT LESSONS.

II. TEACHING LANGUAGE.

III. TEACHING MATHEMATICS.

IV. TEACHING PHYSICS.

V. TEACHING HISTORY

OBJECT LESSONS.

CHAPTER I.

THE NATURE OF OBJECT LESSONS.

OBJECT LESSONS are lessons designed to give elementary culture and instruction by means of objects. They are designed to afford that culture to the young mind which secures a natural development of its faculties, and also to impart a knowledge of the elementary facts and principles of all the sciences.

Such lessons have been introduced into nearly all our schools, and are regarded as an essential part of a system of primary instruction. The credit of introducing Object Lessons, as a distinct method of elementary instruction, has been attributed to Pestalozzi; though Locke, Comenius, and others advocated such instruction before him. In fact, the principle of Object Lessons is as old as instruction itself; for all good teachers have used objects in illustration of abstract subjects. We shall consider briefly their Value, the Preparation required, the Method of giving an object lesson, the Errors to be avoided, and the Course of Instruction; and then present outlines and remarks to suggest a practical course to the young teacher.

Value of Object Lessons.—A system of Object Lessons is of great value in education. Their object, as already stated, is two-fold; to give both culture and instruction to the young mind.

Object Lessons cultivate the Perceptive Powers. Objects are presented requiring pupils to observe their form, color, qualities, etc., and thus the powers of perception are exercised and developed. An object lesson requires a pupil to analyze an object carefully into its parts, to look at its details; and this leads a pupil to acquire the habit of close, accurate, and analytical perception.

Object Lessons give culture to the Memory. Names of objects, their parts, qualities, etc., are to be remembered and recalled. This knowledge being presented in a concrete form makes a much deeper impression upon the memory, and is thus more readily fixed in the mind. Besides, the knowledge communicated is that which is required by the young mind, a knowledge of objects and facts, rather than of abstract ideas and truths; and is thus adapted to give normal exercise and culture to the faculty of the memory.

Object Lessons give culture to the Imagination. They give definite pictures to the representative power as recalled by memory, and thus excite the imagination to create ideal images. The memory may be filled with beautiful pictures of nature which become the type after which the imagination creates its ideals. A system of object lessons, thus operating through the memory, may become a source of rich culture to the imagination.

Object Lessons give culture to the Judgment. Pupils are taught to compare one object with another and determine their relations. The colors of objects are compared with standard colors; the sizes of objects are determined from their relation to fixed standards of size; the length and breadth of rooms, the height of ceilings, etc., are estimated and expressed in different units;—all of which give exercise to the judgment, and thus strengthen and develop it.

Object Lessons give culture to the Attention. The mind of the pupil is aroused and attracted by the object and is thus concentrated upon it. The propensity of the mind of a child to wander from one thing to another is thus checked, and the habit of mental concentration formed. The power of attention is thus largely exercised and cultivated by a system of object lessons.

Object Lessons are especially adapted to give culture in the use of Language. They impart new words as names of objects, qualities, etc., which become fixed in the memory and enrich the pupil's vocabulary. They also give pupils practice in talking, by telling what they see or have learned. They especially cultivate the habit of using words as expressing definite ideas, and thus lead to precision and accuracy in the use of language.

Object Lessons train to habits of definite and accurate conception. Knowledge is most readily conveyed to the mind through the medium of the eye. "Seeing is believing" is an old adage which indicates the exactness of the knowledge which we gain through the sense of vision. Such definite perceptions train the mind to the habit of definite conceptions, of conceiving everything with exactness and completeness. A mind thus trained is not satisfied with the misty and shadowy conceptions which often pass for knowledge.

Object Lessons are of value in imparting Knowledge to the mind. By means of object lessons, the elements of nearly all the different sciences may be presented to children. Thus the elements of geometry may be taught by diagrams cut from pasteboard. The elements of arithmetic may be presented by means of objects and the numeral frame. By means of specimens of plants and insects, by charts, cards, etc., the elements of botany, zoölogy, etc., may be imparted. A system of object lessons, can, therefore, be so arranged as to give pupils a knowledge of the elementary facts of nearly all the sciences. Such a knowledge will prove of great value to them when, in after years, they are prepared to study these branches as sciences.

The instruction in the elements of the physical sciences, as botany, physiology, etc., will be of special value to the pupils of our public schools. Without such instruction, many of them will go out and become citizens, ignorant of the simplest facts and principles of these sciences, for they cannot be expected to study them from a text-book in the ordinary common school. With charts and suitable specimens, a fair knowledge of the fundamental facts of physiology can be given in a few weeks, knowledge absolutely essential to the health and happiness of mankind. In a similar manner, pupils may be made familiar with many of the principal facts of botany, natural philosophy, chemistry, etc.

Preparation for Object Lessons.—Under the Preparation for Object Lessons we shall speak of the Preparation of Material, the Preparation of the Teacher, and the Preparation of the Pupil.

Preparation of Material.—Every school should be provided with objects suitable for giving object lessons. There should be a collection of specimens of leaves, flowers, minerals, bones, all the ordinary grains, specimens of wood, insects, coins, etc. Every school should be provided with a cabinet in which these objects are to be placed and preserved. There should also be charts of colors, of geometrical figures, of animals and plants, etc. Besides these, there should be some apparatus in the public schools, to illustrate the elementary facts and principles of natural philosophy and chemistry. Every school should possess a glass prism, a magnet, a microscope, a galvanic battery, an electrical machine, etc. There are many little things which a teacher can make, or procure with very slight expense, such as a siphon, a tube for pneumatics, etc.; and a live teacher can raise the money among his patrons to procure many of the things mentioned.

Preparation of the Teacher.—The teacher should prepare himself with information upon these objects. This he can do by observation, conversation, and reading. By visiting shops, stores, mills, etc., he will be able to gain a great deal of valuable knowledge of objects and common things which he can use in giving object lessons. He should also consult encyclopedias and other works of general information. In giving lessons on the elements of the different sciences, as geometry, physiology, botany, etc., he can select the facts he needs from the text-books on these subjects.

The teacher should also prepare himself upon the method, as well as upon the matter of an object lesson. He should systematize his knowledge, and arrange it in the order in which it is to be presented. An outline should be prepared; and, if there is time, committed to memory, so that the lesson may not be loose and rambling, but have a system, and be directed toward a definite end.

Preparation of the Pupil.—The pupil should also be required to prepare for the lesson. He should first be required to observe all he can of an object, that he may have an opportunity for the culture of his perceptive powers. He may then make inquiries of older persons, and gain what information he can from them. Lastly, he may go to books treating of the subject, and learn the recorded observations of others This last method is usually the easiest; and care should be taken that the pupil does not resort to it first, and thus, though he may obtain knowledge, lose the primary object of the lesson,—the culture of his senses.

The Method.—In giving an object lesson, the pupils should first be allowed to tell all they know about the object. This will encourage them to prepare for the lesson, and add interest to it, as children love to tell what they know. Secondly, the teacher should lead the pupils to find out all they can of what they have not yet observed respecting the object. Knowledge thus gained will be more interesting to them than if they are told the things by the teacher; and will also stimulate the power of investigating for themselves. Lastly, the teacher should communicate such knowledge as is adapted to the pupil and is appropriate to the subject.

Telling their Knowledge.—The pupils should first be allowed to tell what they know. This will give interest to the study, for children love to talk as the birds love to sing. It also cultivates the habit of speaking from the actual presence of ideas in the mind; and of talking to express thought, and not to repeat words. This is of supreme value in every lesson. In this breaking away from the repeating of words, and the expressing of some real idea in the mind, is found the great reform in modern school education.

Finding Out.—The second step in an object lesson is to lead the pupil to find out knowledge for himself. Here the teacher begins the work of instruction; and this is the key-note of all good teaching. We should smooth and brighten the pathway of the child all we can; but we must also help children to help themselves. We must make them seekers after truth; and not mere receivers of truth. To teach a child to long for truth is better than to give it truth; to excite an appetite to know is far better than to satisfy this appetite. We may thus make him an original truth-seeker, lay the foundations of intellectual power, and develop the spirit which gives us the world's philosophers.

Communicate Knowledge.—The last step is that of communicating knowledge. In the previous step the teacher was a guide to knowledge; here he becomes the source of knowledge. All instruction should have a teacher at its heart; it must contain the central element of personality. This is the crowning element of the teacher's work; the influence of his own thought and feeling in instruction. A large-souled man or woman projects his personality in his instruction and irradiates what he communicates. He puts a charm in knowledge not otherwise seen, and inspires the hearts of his pupils with a love for learning not otherwise felt. Only the man or woman who can do this is a teacher in the high sense of the word, and it needs the best and rarest traits of character to attain it.

Errors to be Avoided.—The teacher should be careful not to mistake the nature and design of an object lesson. He should remember that the primary object is to awaken the faculties of the young mind into a natural and healthful activity; and that the secondary object is to present a knowledge of the elementary facts of the different sciences. He should be careful, therefore, to adapt his instruction to the accomplishment of both these objects.

The teacher should be especially careful not to teach words without ideas. The thing to be named should first be clearly presented to the mind; and then the name be given as a necessity to express the idea of it. Thus every new word becomes an expression of a definite and clearly defined conception. Young teachers should be especially careful to guard against the liability to teach names without corresponding ideas.

Teachers should be careful also not to give matter that is beyond the capacity and appreciation of the pupil. Having no text-book to guide them in these lessons, they must rely on their own judgment; and, without experience, they will find that it is an easy matter to get beyond the understanding and appreciation of the pupil. Great care must be taken to avoid this error, which is a very common one.

Course of Instruction.—A Course of Object Lessons should embrace Lessons on *Form*, *Color*, *Parts of Objects*, *Qualities of Objects*, *Facts concerning Objects*, and the *Elements* of several of the sciences, as Botany, Physiology, etc.

I. Lessons on Form.

The *Lessons on Form* should include all the ordinary geometrical figures. These lessons may be given with figures made of wood or pasteboard, with diagrams on the board, with geometrical charts, etc. There are sets of geometrical figures prepared which should be in every school-room. The pupils should be required to draw these figures on the slate and blackboard. This will afford pleasant employment for them and keep them out of mischief, as well as give them instruction.

We present a brief outline of the lessons on geometrical forms for the aid of young teachers.

- **Elements**
  - Lines.
  - Angles.
  - Surfaces.
  - Volumes.
- Lines
  - Straight.
  - Curved.
  - Broken.
  - Parallel.
  - Oblique.
- Angles
  - Acute.
  - Obtuse.
  - Right.
- **Polygons**
  - Triangles.
  - Quadrilaterals.
  - Pentagons.
  - Hexagons.
  - Heptagons.
  - Octagons.
- Triangles
  - Sides.
    - Equilateral.
    - Isosceles.
    - Scalene.
  - Angles.
    - Acute-angled.
    - Obtuse-angled.
    - Right-angled.
- **Quadrilaterals**
  - Parallelograms
    - Square.
    - Rectangle.
    - Rhombus.
    - Rhomboid.
  - Trapezoid.
  - Trapezium.
- Circle
  - Circumference.
  - Diameter.
  - Radius.
  - Arc.
  - Chord.
  - Segment.
  - Sector.
  - Tangent.
  - Secant.
  - Quadrant.
  - Semi-circle.
  - Semi-circumference.
- **Polyedrons**
  - Prism
    - Cube.
    - Parallelopipedon.
    - Triangular Prism, etc.
  - Pyramid.
  - Frustum of Pyramid.
- **Round Bodies**
  - Cylinder.
  - Cone.
  - Frustum of Cone.
  - Sphere.
- Conic Sections
  - Parabola.
  - Ellipse.
  - Hyperbola.
- Other Bodies
  - Cycloid.
  - Catenary.
  - Spirals.

To the older pupils some of the truths of geometry may be presented, like those found under Elementary Geometry. This will be the only opportunity the large majority of pupils will have to become familiar with these truths, which will be found of real practical value in life.

II. Lessons on Color.

The pupil should receive *Lessons on Color*. He should be taught to distinguish and name all the principal colors. Such lessons can be given only by visible illustrations, since color can be learned only by seeing it. Every school should, therefore, be supplied with a "Chart of Colors," and a "Box of Small Color-cards." It will be well, also, to have specimens of worsteds, pieces of silk, colored papers, flowers in their season, autumn leaves, etc. There should also be a glass prism to analyze a sunbeam, and colored crayons for the blackboard.

The teacher will first present the principal colors on the color chart, and then pass around the small cards or hold them up before the pupils, and have them name the colors. Worsteds, flowers, leaves, and other colored objects, may be used in the same way.

The teacher may also explain the nature of color, that it is a modification of light, and that all colors exist between the extremes of light and darkness. He may also explain the nature of light, that it is the vibration of a very rare fluid called *ether*, producing its effects on the eye somewhat as the vibration of air produces the sensation of sound on the ear.

It will be well, also, to call the attention of the pupil to the phenomenon of color-blindness. Many persons can scarcely discriminate between shades of the same color; others cannot distinguish between colors which are strikingly opposed to one another. There are persons who can only distinguish black and white, and others who cannot tell red cherries from green leaves, except by their shape. Amusing incidents are related in illustration of this peculiarity. An English naval officer chose a blue coat and red trousers, supposing them to be of the same color; and a tailor mended a black silk vest with a patch of crimson. Bartholomew, the sculptor, could not distinguish green from red, and painted the cheeks of a lady's portrait green. Accidents have occurred on railroads on account of the engineer or flagman mistaking colors, and candidates for these positions are now examined as to their powers in this respect.

Calkins, who gives the above facts, also tells us that out of forty boys in a school in Berlin, five could not distinguish between common colors. "From calculations based on examinations made in England and Scotland, it appeared that one person out of every fifteen was unable to distinguish all the ordinary colors; one in fifty-five confounded red with green; one in sixty, brown with green; one in forty-six, blue with green."

It is not necessary to represent the colors in this work, as there should be a chart of colors in every public school. Each teacher should have a copy of Calkins's *New Primary Object Lessons*, published by the Harpers, New York. The following facts and definitions will suggest to the teacher a proper course of instruction in color.

There are three Primary colors,—Red, Yellow, and Blue. These are called *primary* colors, because all other colors may be formed from them.

The three primary colors, if mixed together, will produce white light. Paint them on a wheel in three equal parts, then revolve the wheel, and it will appear white.

There are seven Prismatic colors,—Violet, Indigo, Blue, Green, Yellow, Orange, and Red. These are called prismatic colors because a ray of white light, passing through a glass prism, will be divided into these seven colors. The order of these colors can easily be retained by the word *vibgyor*.

Secondary colors are those which are formed by mixing the primary colors. The secondary colors are, Orange, Green, Indigo, and Violet, or, instead of the last two, Purple.

Orange is formed by mixing red and yellow. Green is formed by mixing blue and yellow. Purple is formed by mixing red and blue.

The different varieties of *Red* are Maroon, Crimson, Scarlet, Carmine, Vermilion, and Pink. The different varieties of *Yellow* are Citrine, Lemon, Canary, Straw, and Yellow. The different varieties of *Blue* are Indigo, Ultramarine, Prussian Blue, Light Blue, and Sky Blue. The different varieties of *Green* are Olive Green, Emerald, Pea Green, and Bright Green. The different varieties of *Purple* are Royal Purple, Purple, Violet, Lilac, and Lavender. The different Varieties of *Orange* are Dark Amber, Orange, Salmon, Buff, and Cream.

Brown is usually composed of red, yellow, and black, sometimes modified by the addition of white. The different varieties of Brown are Chocolate, Russet, Snuff, Drab, and Tan. *Gray* is composed of black and white, with a slight mixture of red, yellow, or black. The different varieties are, Slate, Pearl Gray, Steel Color, and French Gray.

Tertiary colors are formed by mixing two secondary colors, or three primary colors in the proportion of two parts of one and one part of each of the other two colors. The tertiary colors are Citrine, Olive, and Russet.

There are several varieties of colors, indicated by the terms *Shade*, *Tint*, *Hue*, and *Tinge*. A *Shade* is formed by mixing *black* with any color, so as to make it darker than the original color. A *Tint* is formed by mixing *white* with any color, so as to render it lighter than the original color. A *Hue* is formed by combining two colors in unequal proportions; as, a little yellow mixed with pure red gives scarlet, a *hue* of red. A *Tinge* is a slight coloring or tincture added to the principal color; thus, green, if it has a slight coloring of yellow, is said to have a *tinge* of yellow.

Two colors which, when united, produce white light, are said to be *Complementary*. Thus, red and green, orange and blue, yellow and purple, are complementary colors.

By the *Harmony of Colors*, we mean that relation of certain colors, which gives special pleasure to the eye. The complementary colors are harmonious. Since two colors are harmonious, which when mixed together produce white light, for harmony of color we must have one primary and one secondary color. The teacher may show the pupil that in the scale of prismatic colors, the harmonious colors stand to each other in the relation of *fourths*, like one of the richest chords in music.

The teacher may show the application of the harmony of colors, by asking questions about ladies' wearing apparel, furnishing a room, arranging a bouquet, etc.

III. Objects and Their Parts.

Pupils should have lessons on *Objects and their Parts* They should be taught to know and name the parts of objects. For this purpose, teachers should have a suitable collection of objects in the school-room. The information concerning these objects, the teacher can obtain in various ways, as heretofore explained. The following outlines, selected from *Sheldon's Object Lessons*, will suggest a course to the young teacher:

1. Key.
   1. Shaft.
   2. Ring.
   3. Barrel.
   4. Lip.
   5. Wards.
   6. Grooves.

2. Shell.
   1. Body
      1. Mouth.
      2. Lip.
      3. Beak.
      4. Canal.
   2. Spire
      1. Whorls.
      2. Sutures.
      3. Apex.

3. Lead Pencil.
   1. Wood
   2. Lead.
   3. Head.
   4. Point.
   5. Number
   6. Maker's Name, or Trade Mark.

4. Scissors.
   1. Blade.
   2. Bows.
   3. Limbs.
   4. Rivets.
   5. Edges.
   6. Back.
   7. Point.
   8. Shaft.

5. Cent.
   1. Surface.
   2. Faces.
   3. Edges.
   4. Milling.
   5. Impression.
   6. Image.
   7. Superscription.
   8. Date.

6. Cup.
   1. Bowl.
   2. Handle.
   3. Upper Rim
   4. Lower Rim.
   5. Bottom.
   6. Inside.
   7. Outside.
   8. Edges.

7. Pin.
   1. Head.
   2. Point.
   3. Shaft.

8. Apple.
   1. Stem
   2. Peel.
   3. Pulp.
   4. Juice.
   5. Veins.
   6. Dimples.
   7. Eye.
   8. Core.
   9. Seeds.
   10. Seed-case.

9. Bell.
   1. Handle
      1. Nut.
      2. Catch.
      3. Shaft.
      4. Ferule.
      5. Number.
   2. Cup
      1. Border.
      2. Rim.
      3. Edge.
   3. Tongue
      1. Loop.
      2. Clapper.

10. Chair.
    1. Posts
       1. Front.
       2. Back.
    2. Rounds
       1. Front.
       2. Side.
       3. Back.
    3. Back.
    4. Seat.
    5. Pillars.
    6. Spindles.
    7. Slats.
    8. Balls.
    9. Beads.
    10. Scallops.
    11. Brace.

11. Pail.
    1. Bail.
    2. Handle.
    3. Ears.
    4. Body.
    5. Staves.
    6. Hoops.
    7. Bottom.
    8. Rivets.
    9. Chime.
    10. Crole.

12. Acorn.
    1. Nut
       1. Shell.
       2. Kernel.
       3. Point.
       4. Scar.
       5. Membrane.
    2. Cup
       1. Scales.
       2. Edges.
       3. Stem.

13. Shoe.
    1. Upper.
    2. Sole.
    3. Heel.
    4. Tip.
    5. Eyelets.
    6. Binding.
    7. Seams.
    8. Tongue.
    9. Lining.
    10. Insole.
    11. Counter.
    12. Shank.
    13. Welt.
    14. Strings.
    15. Buttons.
    16. Vamps.

14. Knife.
    1. Handle
       1. Rivets.
       2. Frame.
       3. Heel.
       4. Sides.
       5. Back.
       6. Spring.
       7. Grooves.
       8. Plate.
    2. Joint { Pivot.
    3. Blade
       1. Edge.
       2. Point.
       3. Back.
       4. Notch.
       5. Sides.
       6. Maker's name.

Every teacher of a primary or public school should go to work and collect facts concerning other objects, and prepare outlines for giving lessons upon them. No teacher should be without a copy of *Sheldon's Object Lessons*, published by Scribner, Armstrong & Co.

IV. Qualities of Objects.

Pupils should be taught to distinguish and name the *Qualities of Objects.* These qualities should be taught, not abstractly, but in connection with the objects in which they are found. The pupil should be led to perceive the quality in the object, and thus obtain a clear idea of it, and then its name may be presented and fixed in the memory.

The following list of qualities will suggest to the teacher his work in this respect:

Hard,	Brittle,	Round,	Woven,
Soft,	Flexible,	Square,	Cellular,
Rough,	Pliable,	Angular,	Tubular,
Smooth,	Elastic,	Triangular,	Netted,
Stiff,	Ductile,	Rectangular,	Fibrous,
Limber,	Malleable,	Cylindrical,	Porous,
Light,	Buoyant,	Spherical,	Twisted,
Heavy,	Sonorous,	Concave,	Indented,
Solid,	Fusible,	Convex,	Crystallized,
Liquid,	Volatile,	Spiral,	Membranous,

Transparent,	Natural,	Saline,
Translucent,	Artificial,	Odorous,
Opaque,	Durable,	Aromatic,
Brilliant,	Compressible,	Edible,
Adhesive,	Pulverable,	Tasteless,
Tenacious,	Soluble,	Pungent,
Amorphous,	Insoluble,	Emollient,
Inflammable,	Impervious,	Sapid,
Combustible.	Serrated,	Nutritious.

V. Elements of Botany.

Object lessons on the *Elements of Botany* may embrace the *flower* and its parts, the *leaf* and its parts, the *names* of leaves from their *forms*, the *names* of leaves from their *margins*, the *names* of *plants*, *trees*, etc.

The following outline will suggest to the teacher a short course in botany:

- **Parts of Flower**
  - Calyx — Sepals.
  - Corolla — Petals.
  - Stamens
    - Filament.
    - Anther.
    - Pollen.
  - Pistils
    - Style.
    - Stigma.
    - Ovary.
  - Peduncle.

- **Parts of Leaf**
  - Blade.
  - Midrib.
  - Vein.
  - Veinlets.
  - Parenchyma.
  - Margin.
  - Apex.
  - Base.
  - Petiole.
  - Stipule.

- **Margins of Leaves**
  - Entire.
  - Serrate.
  - Dentate.
  - Crenate.
  - Repand.
  - Lobed.

- **Bases of Leaves**
  - Cordate.
  - Reniform.
  - Auriculate.
  - Hastate.
  - Sagittate.
  - Oblique.
  - Tapering.
  - Clasping.
  - Connate.
  - Decurrent.

- **Apices of Leaves**
  - Acute.
  - Acuminate.
  - Obtuse.
  - Truncate.
  - Retuse.
  - Obcordate.
  - Emarginate.
  - Mucronate.
  - Cuspidate.

- **Shape of Leaves**
  - Orbicular.
  - Rotundate.
  - Elliptical.
  - Oblong.
  - Linear.
  - Acicular.
  - Deltoid.
  - Ovate.
  - Lanceolate.
  - Cordiform.
  - Hastate.
  - Sagittate.
  - Peltate.
  - Runcinate.
  - Pedate.
  - Lyrate.

- **Corolla**
  - Petal
    - Limb.
    - Claw.
  - Cruciferous.
  - Rosaceous.
  - Liliaceous.
  - Papilionaceous
    - Banner.
    - Wings.
    - Keel.
  - Rotate.
  - Campanulate.
  - Salver-form.
  - Funnel-form.
  - Labiate.

In every public school there should be charts containing diagrams of all these forms, and the teacher should obtain specimens of them from nature. A work recommended for the teacher is Miss Youmans's *First Book in Botany*, published by Appleton & Co.

There should also be a course of instruction on insects, birds, and other animals, which may be given by colored engravings, specimens, etc.

LANGUAGE.

CHAPTER I.

THE NATURE OF LANGUAGE.

LANGUAGE is the instrument of thought and the medium of expression. The term is derived from *lingua*, the tongue, and meant primarily that which came from or was moulded by the tongue.

The primary idea of language is that it is the means of expressing our ideas and thoughts. It is the means by which we convey ideas and thoughts from one mind to another. It is seen, moreover, that language is necessary to thought; that we think by means of language. Sir William Hamilton and other philosophers hold that there can be no thinking without thought symbols; that is, without words. If we add this further use of language to the primary idea of expressing thought, we have the definition given above.

Language, as it now exists, means also the embodiment of thought in words. It is thought expressed, as well as the power of expressing thought; it is thought made tangible to the senses of sight and hearing. Human language has been figuratively called the outward *type* or *form* which thoughts and the laws which regulate them, impress on the material of sound. Plato says, "reason and discourse are one," the former being the conversation of the soul with herself, without the intervention of sound; the latter being this conversa tion made audible by sound. Max Müller says,—"Language and thought are inseparable. Words without thoughts are dead sounds; thoughts without words are nothing. To think is to speak low; to speak is to think aloud. The word is the thought incarnate." Language is of two kinds; *Oral* and *Written.*

I. Spoken Language.

Definition.—Oral Language consists of a combination of articulate sounds to express ideas. An articulate sound is literally a jointed sound, and is thus distinguished from a continuous sound, as a cry, etc. The sounds which are united in the formation of spoken words are called *elementary sounds*, and consist, in our language, of about forty. The exact number has not been definitely determined by orthoepists.

Origin of Language.—There are two general theories for the origin of spoken language,—the theory of *Divine Origin*, and the theory of *Human Origin.* The theory of a divine origin assumes that God gave man a language when he created him, by which he could immediately communicate his ideas and thoughts. In favor of this theory, it is argued that God pronounced His work to be perfect, and that man would not have been perfect without the gift of a language. It is also claimed that man must have had a language, or he could not have conversed with God, as he is represented doing in the Garden of Eden.

The theory of a human origin assumes that man had originally no language, but merely the power to form a language. He had the gift of speech as he had the gift of reason, and he formed his own language as he has formed the other arts and sciences. In favor of this theory, it is claimed that it is natural to suppose an analogy between the development of language and the development of the arts and sciences. Man was not created with a knowledge of the science of geometry, but with powers by which he could originate it. Language was an evolution from man's capabilities, the same as the sciences.

It is also claimed that the history of languages shows a growth and development from rude beginnings to a more finished form. It is further held that the Bible presents this view, for it says that the animals were brought before Adam to see what he would call them, "and whatever Adam called them, that was the name thereof." It is further held that so strong is this power of speech that children at the present time, if placed where they never heard a word spoken, would form a language of their own. Instances are recorded in which the children in a family have actually formed a language for themselves. It is now the general belief of writers upon the subject that language is of human, rather than of divine origin.

Theories of Origin.—Assuming that language is of human origin, the question arises,—How or in what way was it formed? Several theories have been offered as the answer to this question, which have been distinguished as the theories of *Imitation*, *Interjections*, and *Verbal Roots*. The first and second are also called the *Mimetic* and *Exclamatory* theories, and the last the theory of *Phonetic Types*.

Theory of Imitation.—The theory of Imitation assumes that words originated in the imitation of the sounds of nature Thus man heard a dog say *bow-wow*, and he called it a *bow-wow*. He heard a sheep say *baa*, and he called it a *baa*. He heard a bee *buzz*, and he imitated the sound, and *buzz* became the name of a bee. It was supposed that by this principle of onomatopœia originated many such words as *crash*, *hiss*, *roar*, *crack*, *thunder*, etc.

This theory, which was once popular, is now generally discarded by philologists. It is probable that very few words originated in this way. Many words which were supposed to have thus originated, have been traced to quite a different origin. Thus, *squirrel*, which was supposed to be an imitation of the noise made by the animal, has been found to mean a "shade tail;" *cat*, or the German *katze*, which was supposed to represent the noise made by the cat, comes from an expression meaning "an animal that cleans herself;" *thunder*, which was supposed to represent the rolling noise of the clap, comes from *tan*, signifying to *stretch*. A few words, as *whippoorwill*, *cuckoo*, etc., had their origin in this way; but such words are sterile, have no reproducing power, and thus are not considered to be true words.

Theory of Interjections.—The theory of Interjections assumes that all words originated from primary utterances of emotions. Thus all races emit certain similar ejaculations to express similar feelings of pain or joy. The *cry*, the *groan*, the *laugh*, etc., are common to all mankind. These natural utterances are supposed to have been the basis of language. There is no authority, however, for the theory, and it has now no supporters. Max Müller calls this the *Pooh-pooh* theory. He also calls the theory of Imitation the *Bow-wow* theory.

Theory of Verbal Roots.—The theory of Verbal Roots assumes that man was primarily endowed with a "linguistic instinct" by which he gave origin to verbal utterances. These primary utterances were very numerous; many of them perished in the struggle for life, but those which remained became the parents of all the other words of the language. These expressions were verbal in their character, and hence are called the verbal roots of the language; and the theory is known as the theory of Verbal Roots.

In favor of this theory, it may be argued that a large part of the language can be traced back to verbs. If we open the dictionary for the etymology of a word, we usually find that it is derived from a verb. The preposition *except* was originally the past participle of the verb *to except*, etc.; and even the conjunction *if* had its origin in a verb *gif*, to give or grant. The importance of the verb, which means *the word* (*verbum*), is also a consideration in favor of the theory. The Chinese call verbs *living words*, and all others, *dead words*.

The theory, however, is not generally accepted. Whitney ridicules it, calling it the *Ding-dong* theory, an epithet derived from Müller's illustration, that everything struck rings, and that the mind of the primitive man, when struck by the objects of nature, rang out with a sound. The theory was first proposed by Heyse, and advocated by Müller, who, however, now discards it.

The True Theory.—The true theory for the origin of language is, that it is a natural outgrowth of man's mental and vocal powers. Man was gifted with the power of thought and feeling, and the faculty of expression. He was moved by his desires and impulses to embody his thought in vocal utterances. These utterances were made partly by chance, aided perhaps by the imitation of the sounds of nature. They gradually developed into more and more perfect forms, through the necessity and pleasure of communication, and the progress of the race in refinement and intellectual culture.

In this evolution, thought and language, on account of their intimate relation, must have gone hand in hand. Which preceded the other, has been a question among philosophers. Geiger holds that man was guided in his utterances by that which he saw, and that the use of language, in a measure, preceded and produced reasoning. Prof. Whitney and others maintain that thought is anterior to language, and independent of it; and that thought need not be internally or externally expressed to be thought. In fact, however, the two must have developed together, and language not only expressed thought but aided it in its origin and growth.

The Primitive Language.—Which was the primitive language is not positively known; the question, however, is a very old one. Herodotus tells us that Psammitichus, King of Egypt, to ascertain the most ancient nation, gave two new-born children to a shepherd to be brought up so as never to hear any words spoken. When they were about two years old, they held out their hands for bread and cried "Becos," which they continued to use for the same purpose. This being reported to the king, he inquired what people called bread "Becos"; and discovered that it was the Phrygians, and thus inferred that the Phrygian was the primitive language. James IV. of Scotland, in order to ascertain the primitive language, placed a deaf and dumb woman with two infant children, on the solitary island of Inchkeith, to see what language they would use when they came to the age of speech. A Scotch historian, who gives the account, naively remarks, "Some say they spoke good Hebrew; for my part, I know not, but from report."

The English Language.—The historical origin and development of the English language is well known. The island of Britain was originally settled by the Celts, a branch of the great Indo-European race, which had moved west, on the wave of emigration, from Central Asia. Remains of the same race are found all along the Atlantic coasts of Europe, though they were mainly congregated in Spain, Gaul, Britain, and the adjacent islands.

In the year 55 B. C., the Romans under Julius Cæsar, who had previously conquered Gaul, passed over into Britain and subdued and held possession of it for nearly five centuries. Very few Latin words, however, were introduced into the language of Britain during the Roman occupation, perhaps not more than a dozen. A few names of places derived from *castra*, a camp, remain; as Chester, Westchester, Chichester, Winchester, Lancaster, which indicate that the military camps of the Romans became centres of trade, and grew into towns.

About the fifth century the northern barbarians invaded Southern Europe, and threatened the overthrow of the corrupt and imbecile Roman provinces. Rome, to defend herself, was obliged to withdraw her forces, and leave Britain to contend with the tribes that surrounded her. In the year 451 the Saxons, a Teutonic tribe from the southern shores of the Baltic, under the lead of the two brothers, Hengist and Horsa, came over and settled on the shores of Kent. Swarms of the same tribes followed from time to time, and drove the Celts into the mountains of Wales and Cornwall. In the year 827, about four centuries after the invasion, seven independent kingdoms had been established, known as the Saxon Heptarchy. The most important of these Teutonic tribes were the Jutes, the Angles, and the Saxons. The Angles, who seem to have been distinguished for their energy and intelligence, though small in numbers, gave their name to the island, England being a modification of Angle-land. The Saxon language thus became the language of the island, a few Celtic names being mixed with it. During the ninth and tenth centuries, the Danes, a Scandinavian tribe, made incursions and conquests, and introduced a few words into the Saxon language.

In 1066, William, Duke of Normandy, invaded England, and, by the decisive battle of Hastings, established himself on the English throne. He divided the island among his followers, and determined to incorporate the Saxons with the Normans, and introduce the Norman language as the language of the island. To effect this, he ordered that the youth in the schools should be instructed in the Norman language, that the pupils of the grammar schools should translate Latin into French, and that all conversation in them should be carried on in one of these languages. Pleadings in the courts were to be in French, deeds were to be drawn in this language, no other tongue was used at court and in fashionable society. So great was this influence, that English nobles themselves affected to excel in the foreign dialect. The mass of the people, however, at first resisted this change; but finally, as the two peoples intermingled, their languages intermingled also, and the English language is the result,—the basis of it being Saxon, and about one-third of it being from the Norman French.

The Norman French was mainly a Latin tongue. The Normans, or Northmen, were originally the inhabitants of ancient

Scandinavia—Norway, Sweden, and Denmark. Under Rollo, about 912 A. D., they had conquered and settled in a province of France, where in time they adopted the religion and language of the French. The French was a corrupt form of Latin, formed by the mixture of the Latin introduced into Gaul by the Romans, and the language of the Germanic tribes who afterwards conquered it. The Norman conquest thus introduced a large element of Latin into the English language. A large number of Latin words were subsequently introduced by Latin scholars; and in the same way the Greek element of our language originated. Words of other languages have been introduced by business, commercial relations, etc. The English language is thus a composite tongue, its basis being the Anglo-Saxon, with about one-third Latin, a sprinkling of Greek, and a few words from other tongues.

Classification of Language.—Attempts have been made to classify the different languages, but no scheme has been given which is universally adopted. Max Müller speaks of four distinct stages in the growth of language: the first being the epoch of roots; the second being the epoch of juxtaposition and concentration, as in the Chinese; the third being the agglutinative stage, represented by the Turanian tongues; and the fourth being the inflexional stage, or stage of amalgamation, represented by the Semitic and Aryan languages.

An arrangement based on outward differences of form, that will give quite a clear idea of the subject, divides languages into three classes; the Monosyllabic, the Agglutinated, and the Inflected. The Monosyllabic class contains those languages which consist only of separate unvaried monosyllables. The words do not naturally affiliate, and the scientific forms or principles of grammar are either wanting or very imperfect. It includes the Chinese and Japanese languages and also the dialects of the North American Indians. In the Agglutinated languages, the words combine only in a mechanical way; they have no elective affinity and manifest no capabilities of a living organism. Prepositions are joined to nouns and pronouns to verbs, but not so as to make a new form of the original word, as in the inflected tongues. This class is called Turanian, from Turan, a name of Central Asia. The principal varieties of this family are the Tartar, Finnish, Lappish, Hungarian, and Caucasian.

The Inflected languages have a complete interior organization, with mutual relations and adaptations. They differ from the Monosyllabic as organic from inorganic forms; and from the Agglutinated as vegetable growths from mineral accretions. This class includes the culture of the world, and in their history lies embosomed the history of civilization.

To this class belong two great families, the Semitic and the Indo-European. The Semitic embraces the languages native to Southwestern Asia, supposed to have been spoken by the descendants of Shem. It includes the Hebrew, Aramæan, Arabic, the Ancient Egyptian or Coptic, the Chaldean, and Phœnician. The Semitic languages differ widely from the Indo-European in their grammar, vocabulary, and idioms. On account of the pictorial element in them, they may be called the metaphorical languages, while the Indo-European may be called the philosophical languages.

The two principal languages of the Indo-European stock are the Aryan and the Græco-Italic, or Pelasgic. The word Aryan (Sanskrit, Arya) signifies *well-born*, and was applied by the ancient Hindoos to themselves in contra-distinction from the rest of the world, whom they considered base-born and contemptible. The Pelasgic comprises the Greek family and its dialects and the Italic family, the chief subdivisions of which are the Etruscan, the Latin, and the modern languages derived from the Latin. The other Indo-European families are the Lettic, Slavic, Gothic, and Celtic, with their various subdivisions.

The Indo-European languages are noted for their variety, flexibility, beauty, and strength. They are remarkable for vitality, and possess the power of regenerating themselves and bringing forth new linguistic creations. They render most faithfully the various workings of the human mind—its wants, its aspirations, its passions, its imaginings—and embody and express the highest products of its thought and philosophy. Through them, modern civilization, by a chain reaching through many thousand years, ascends to its primitive source.

II. Written Language.

Written Language is the art of expressing ideas and thoughts by means of visible symbols. It is the embodiment of mental products in a form by which they may be transmitted to the mind through the eye, as spoken language communicates them through the ear.

Written language may be either ideographic or phonetic. Ideographic writing may be either pictorial, representing objects by imitating their form, or symbolic, indicating their nature or proportions. Phonetic writing may be syllabic or alphabetic; in the former each character represents a syllable, in the latter an elementary sound.

Origin of Written Language.—Of the origin of written language, but little is positively known. The Egyptians ascribed it to Thoth, the Greeks to Hermes or Cadmus, and the Scandinavians to Odin. The first step toward writing was probably the rude pictorial representation of objects, the next step was the application of a symbolic signification to some of these figures. Pictures, abbreviated for convenience and by constant use, gradually became conventional signs; and at last these characters became the symbols of the sounds of spoken language.

Systems of Written Language.—There have been four distinct systems of written language; the Ideographic, the Verbal, the Syllabic, and the Alphabetic. These bear certain historic relations to each other, the last being an outgrowth of the first through the intermediate stages of the other two. A brief description will be given of each.

The Ideographic.—The Ideographic system (*idea*, idea, and *grapho*, I write), represented things by pictures and symbols. Concrete objects were indicated by their pictures, and abstract ideas by their symbols, etc. Thus, the *sun* was indicated by a circle with a dot inside, ⊙, the *moon*, by a crescent, with a line inside, , a *mountain* by three peaks, side by side, ΛΛΛ, *rain* by drops under an overarching line, , a child thus, . These symbols could be combined to represent other objects. Thus *water* and *eye* combined represented *tears;* an *ear* and a *door* represented *hearing* or *understanding.*

Actions would be represented by objects in the attitude of the act, as *flying* by a picture of a flying bird, *ascending* by the picture of a person walking up a hill, etc. Some characters were used symbolically, as a *hand* to indicate a *workman*, *two valves* of a shell-fish to denote *friends. Relations* could also be represented, as *above*, by a dot over a horizontal line, *below* by a dot below a horizontal line, right by the symbol , and left by , etc. These illustrations are taken from the Chinese system of written language.

The system of writing among the Egyptians was hieroglyphic, and is considered the finest of the kind. The *sun* with rays streaming from it, denoted *light* and *brightness;* the *moon*, with its horns turned upward, denoted the *month.* They represented a *siege* by a scaling ladder, a *battle* by two hands, one holding a shield and the other an offensive weapon, *ingratitude* by a viper, *providence* by an eye, etc. Two legs with the feet denoted *movement*, forward or backward, according to the direction of the feet, Λ or Λ. The different emotions were indicated by the position of a man affected by them. Sometimes the symbol is purely metaphorical, as when a *king* is represented by a bee, *knowledge* by a roll of papyrus, *justice* by the feather of an ostrich, because all the feathers of that bird were supposed to be of equal length.

This kind of writing was very early used in Egypt and probably in most of the ancient nations. It is the way in which rude races would naturally attempt to express their ideas by characters. In Mexico, when the Spaniards landed, intelligence was sent to Montezuma by paintings on cloth.

The Verbal System.—The Verbal System is that in which the spoken words of a language are represented by a symbol. This is but a stage of the Ideographic system. The characters which were at first pictures or symbols of *objects*, would in time become so modified that they would no longer represent the object, but would be mere abstract symbols of objects and ideas. These abstract symbols, however, would represent, not the spoken words, but the objects and ideas. Thus, in the Chinese written language, which is largely verbal, each character has a name quite distinct from the name of the object represented by the character; and children are required to learn the character and its name before they learn what the character represents. But it is clear that people would, in time, begin to make an association between the character and the spoken word; and the ideographic system would thus become, to a great extent, verbal.

The Syllabic System.—The Syllabic System is that in which the syllables of spoken words are represented by characters. This was a natural outgrowth of the ideographic and verbal systems. As soon as characters came to be used to represent spoken words, it would be noticed that many words consisted of similar parts, and the idea would occur of representing these parts by means of characters. Thus all such words as *confer*, *contain*, *conscience*, etc., would have a common character to represent the first part.

It has been supposed that, at one time, all the Asiatic nations known to the ancients under the names of Syrians and Assyrians used the syllabic mode of writing. The Chinese language is partly ideographic or verbal, and partly syllabic. In it there are 214 *elementary signs* or *keys*, which are strictly hieroglyphic, or abridged representations of visible objects. From these 214 elements, all the characters of the language (80,000, it is said) are formed by varying and combining these, every compound character representing one or more syllables having a distinct meaning.

The Alphabetic System.—The Syllabic System would lead naturally to the Alphabetic System. Having analyzed oral words into syllabic parts, the next step would be to analyze syllables into their elements, and thus reach the elementary sounds of the language, which would be represented by characters. In adopting characters for the elementary sounds, it would be natural to select some of those which were already in use in the ideographic or syllabic system, taking those which stood for words or syllables approximating the elementary sounds. For example, the Egyptian word, *Ahom*, signified an eagle; the figure of an eagle, therefore, stood, it was said, for the letter A, with which the word begins. B was represented by a censer (Berbe); R sometimes by a mouth (Ro), sometimes by a tear (Rimé). An alphabetic system of writing had in this manner sprung up in Egypt (the hieroglyphics are partly alphabetic), but it was too imperfect to become an instrument of popular literature, and some have supposed that the Phœnician alphabetic system was formed out of the Egyptian system.

III. Course in Language.

Instruction in language includes eight things; Learning to Talk, Learning to Read, Pronunciation, Orthography, Read ing, Lexicology, Grammar, and Composition. There are some other divisions, but these are all that are taught in the ordinary public schools.

Learning to Talk.—The child usually learns to talk at home before it is sent to school. Its teachers are its parents and the other members of the household. It learns by imitation and the principle of association. It hears words used and makes an association between them and the objects or ideas for which they stand, and finally imitates them in its attempts to talk.

This work being done so largely out of the school-room, does not seem to fall within the immediate province of the teacher. Much, however, might be said in advising parents to teach their children to talk correctly and with elegance. Culture of this kind is of the utmost value to the child. Habits of speech acquired in early childhood from parents and companions, stick to to us through life and are often a blemish to high scholarship. Parents cannot be too careful in this respect. Aristotle obtained his elegance of language from his mother, and Alexander, it is said, never recovered from the bad habits acquired from Leonides, one of his early teachers.

Teachers can also do a great deal to improve the oral language of their pupils. Pains should be taken to correct their mispronunciations and grammatical constructions so that they may speak correct and even elegant English; and they will then express themselves correctly when they come to use written language. There should be "talking classes" in the public schools in which the aim should be to train pupils to a ready and accurate use of the mother tongue. Much of the instruction that is now given in the reading classes could be given in these talking classes. Pupils should have exercises in "talking compositions" before they come to "writing compositions." From these they will readily see that writing a composition is merely "writing their talk."

We urge teachers to take great pains in moulding the oral language of their pupils, so that they may become fluent and pleasing talkers. The art of conversation is one of the most beautiful of the arts, and we should be careful that it does not become numbered among the "Lost Arts."

CHAPTER II.

TEACHING A CHILD TO READ.

A CHILD'S first lesson in language is *Learning to Talk.* This it receives in the hallowed precincts of home, where the mother is the teacher. A child's first lesson in language, upon entering school, is *Learning to Read.* The teacher's first work, therefore, is to teach the child to read written language. In this chapter we shall consider the methods of leading a child to a knowledge of written words.

The process of Learning to Read consists in learning to recognize written signs, and in associating spoken words with them. It embraces two things; first, the learning of sight symbols, and second, the associating of sound symbols with them. The basis of learning to read is, therefore, oral language.

From this consideration, several fundamental principles arise to guide the teacher in the work. 1. A knowledge of written words should be based on a knowledge of spoken words. 2. There should be a transition from spoken to written word signs. 3. The lessons should begin with words and pass to sentences as in spoken language. 4. The first lessons should be with words relating to familiar objects, actions, qualities, etc. 5. The written word should be regarded as a representative of the spoken word, as the spoken word is the expression of the object or idea.

I. Methods of Teaching.—There are several methods of teaching a child to read. The most prominent of these are the Alphabetic Method, the Word Method, the Sentence Method, the Phonic Method, and the Phonetic Method. All of these have been practiced, and nearly all of them are still used, and have their advocates.

The Alphabetic Method.—The Alphabetic Method begins by teaching the child the names of the letters. When these, or a sufficient number of them, have been learned, the child is taught to pronounce words by means of these names. This method, until within a few years, was universally employed; and it is still used by a large number of teachers. It is objectionable, however, and should be discarded. The objection is, that the word is not a synthesis of the names of the letters, neither do the names suggest the pronunciation of the word. The subject will be more fully discussed under pronunciation.

The Word Method.—The Word Method begins by teaching words as wholes, without regard to the letters which compose them. Among the first to use the Word Method was Jacotot (1770-1840), a French philosopher and teacher; the most prominent advocate of it in this country is Prof. Webb, and by many it is known as the *Webb* method. In England it is popularly known as the "Look and Say" method, or as the method of "Reading without Spelling."

This is undoubtedly a correct method with which to begin the subject. It is really the way in which pupils taught by the previous method actually learned to recognize words, for when a child spelled a word by calling its letters, he knew no more about its pronunciation than he did before he spelled it. The teacher gave him the name of the word, and when he forgot it, named it again and again, until he made a permanent association between the sound symbol and the sight symbol, and thus remembered its name.

The Sentence Method.—The Sentence Method is that which begins with sentences instead of letters or separate words. By it the child's attention is called to some thought orally expressed, and then the written expression for this as a whole is presented and taught. The reason given for this method is "that the sentence is the unit of language," and that we read by sentences rather than by words. It is also claimed that pupils taught in this way read with more ease and with greater naturalness of expression. It is said that in order to read well, the eye must be kept in advance of the voice, which this method requires.

There are several objections to the sentence method. First, it does not begin at the *unit* of language, which we believe to be the *word* rather than the *sentence*. Second, pupils taught by this method very soon recognize the separate words, and consequently read by words rather than by sentences Third, it is impossible that all or even a very large number of sentences can be taught in this way, and eventually the child must come to the learning of separate words, in order to learn to read. Since word-reading must be learned and used, it seems best to begin in this way.

The Phonic Method.—By the Phonic Method pupils are taught to pronounce words by combining the elementary sounds represented by the letters. It begins by teaching the elementary sounds and the characters which represent them. It uses the twenty-six characters of the alphabet to represent twenty-six sounds, and then employs a notation to indicate the remaining sounds. It also indicates the silent letters of words by printing them in italics or a different-faced type.

The Phonic Method is, beyond question, the correct method of teaching pupils to pronounce words. It is natural and simple, and enables a pupil to pronounce a new word independently of the teacher. In connection with the Word Method, it is the true method of teaching a child to read. It will be discussed more in detail under Pronunciation.

The Phonetic Method.—The Phonetic Method is in principle similar to the Phonic Method. It begins by teaching the elementary sounds and the characters which represent them. It uses the twenty-six letters of the alphabet to represent twenty-six sounds, and then invents other characters to represent the remaining sounds. It spells the words as they are pronounced, using only as many characters as are sounded, and requires the pupil to make a transition from the phonetic form of the word to the ordinary form. It will be further considered under Pronunciation.

II. THE TRUE METHOD.—Having stated the several methods by which a child may be taught to read, we proceed to describe what we regard as the correct method in practice. The true method consists of a combination of the Word Method and the Phonic Method. We should begin with the Word Method, and after the child becomes familiar with a number of words, and can read little sentences, we should analyze the words into their elementary sounds and characters, and thus connect with it the Phonic Method.

The Word Method.—The True Method begins with words. The proper place for a child to begin to learn to read is not with the letters of a word, but with the word itself. The reasons for this are many, a few of which will be stated.

First, the Word is the Unit of language. Language begins with words, not with letters or sentences. Letters are the fractions of written words, and we should not begin with fractions. Sentences are the syntheses of linguistic units, and the units should precede their combination. Second, it coincides with the manner of learning oral language. The child begins language with spoken words, and not with their elements, the elementary sounds. It would be as sensible for a mother to teach her child to talk by beginning with the elementary sounds, as for one to teach a child to read by beginning with the letters.

Third, it is in accordance with a fundamental principle of teaching, *from the known to the unknown*. We begin with the spoken word which is known, and pass from it to the unknown written word. To begin with the letters, is to deal entirely with the unknown, as these abstract and arbitrary symbols cannot, except in a few instances, be associated with anything known. Besides, the method of beginning with words is much more interesting to the child, as in a few lessons he is reading little sentences which he understands.

Fourth, to begin at the word as a whole, and pass to its parts, proceeds by analysis, which is the natural way in which a little child acquires knowledge. It knows a horse or a tree, not by beginning with their parts and uniting them into one complete object, but by first knowing them as wholes, and subsequently becoming familiar with their parts. The natural law of instruction is from the whole to the parts; first analysis and then synthesis.

For one who has not used this method, it is natural to think that a child cannot know a written word without knowing the letters which compose it. This, however, is a mistake. We do not analyze a word into its letters when we read, any more than we analyze an object, like a horse, into its parts, in order to be able to know what it is. We know the object as a whole, at a glance, and remember its name; so we know a word by its general appearance, just as we know a picture or an object. It stands before the mind as a picture of an idea or of a spoken word.

It may also be objected that all words cannot be learned in this way; and that the pupil acquires no power to pronounce independently of the teacher. The same objection applies to the alphabetic method, from whose advocates this objection is liable to come. The fact is, that both should be followed by the phonic method, by which a pupil may learn to pronounce independently of the teacher.

The method, however, becomes more than a "look and say" method to the learner. The child soon begins to make comparisons, and discover analogies which aid him in pronunciation. The teacher may advert to no principle of sound, but the child does so spontaneously and unconsciously. The association of sound with sign which he makes in one word, he endeavors to apply in other analogous words, as any one will notice who observes carefully. He thus learns to pronounce many words independently of the teacher, as he does in using the alphabetic method.

The First Step, therefore, in teaching a child to read, is to begin with the written word, as the child begins spoken language with the spoken word. The first lesson is a lesson on printed words. We should begin with some familiar spoken word which the child knows, and then pass to the written word, and make it known. We teach a few words in this way and then unite them into sentences, and have the child read little sentences. After he has been reading several days, or a few weeks, if the teacher prefers, we should pass to the Phonic Method.

Phonic Method.—The *Second Step* is to pass to the elements of words. As there are two classes of words, oral and written, so there are two classes of elements of words. The elements of spoken words are the *elementary sounds;* the elements of written words are the *letters*.

It has been a question which elements we should present first, the sounds or the letters; but it is a question easily answered. Since we learn spoken words before written words, we should first analyze the spoken words into their elements, and subsequently teach the characters which represent them. By analyzing a word, as *cat*, we show the pupil that a spoken word consists of distinct sounds; we then teach him to make these sounds, and afterward teach the characters which represent them. In this way the letters are introduced as symbols of sounds, and not as abstract characters with names.

In presenting these characters, since some letters represent different sounds, it is necessary to introduce a system of notation to indicate the sound of those characters that represent more than one sound. This notation may be the figures 1, 2, 3, etc., used as indices or subscripts, or the notation of the dictionary. In practice, it will be best to use the notation of the reader or speller used in the school.

It is also necessary to indicate the silent letters of words, so that pupils may know just what letters are to be sounded in pronouncing printed words. This can be done by printing such letters in italics, as is the general custom, or in a lighter faced type, as in Dr. Leigh's method, or by printing them with a stroke across them, as is done in Appleton's series of readers.

The *Third Step* is to require the pupil to pronounce words by combining the sounds of the letters which they see combined in the words. Thus, when he sees the word *bat*, he knows the first sound is that of *b*, the second *ah*, and the third the aspirate *t;* and uttering these sounds in their order, he has the correct pronunciation of the word *bat*. Or, suppose the word is fi*gh*t; he sees that *g* and *h* are not to be sounded, and he gives the sounds of *f*, *i*, and *t*, one after another, so that they coalesce, and he has the correct pronunciation of the word *fight*. The pupil, becoming familiar with the words printed in this form, will readily recognize them, and be able to pronounce them when printed in the ordinary form.

Last of all, teach the names of the letters and their order in the alphabet. Should it be asked how soon the names of the letters should be introduced, we answer that if the pupils know the names of the letters by the time they have completed the primer or primary reader, it is sufficient for all practical purposes. They have very little use for their names, and may distinguish them by their sounds at first.

Model Lesson.—To illustrate, suppose we begin with a common word like *cat*. I ask some questions and talk about a cat. I then point to the picture of a cat on the card or in the book, and ask its name, which the pupils give me. I then call attention to the fact that all these sounds which we make when we talk are called *words*. I then lead them to notice that the words which they know are those which they *hear*. I then tell them that there are also words which they can *see*, and awaken an interest to know such words. I then point out the word *cat* on the card or in the book, and tell them that it is the visible or written word *cat*. In the same way I teach the written words that represent other objects.

I next teach written words that are not the names of objects. I have the pupils say something about an object; as, "I see a cat," and then show them this sentence on the card or in the book, or I write it on the board; and then teach them each word of this sentence. I do the same with other sentences, making use of some of the words already learned, and proceed thus as far as I deem it advisable. In this way I pass from *audible speech* to *visible speech.*

After the pupils have learned quite a number of words and read several pages in their primer, I proceed to the analysis of words into their elements. To give them an idea of the elements of words, I first take some object, as a *knife*, and lead them to see that it consists of parts. I then take some oral word, as *cat*, and pronouncing it slowly, separate it into its three phonetic elements, the sounds of *c*, *a*, and *t*, and let them hear that this word consists of three distinct sounds. I then have the pupils give these elements, imitating the sounds as I make them. I then teach them the letters (not their names) *c*, *a*, and *t*, which represent these sounds. I then have them unite these sounds in succession, as they see the letters united in the word, and thus pronounce the word. I proceed in the same way with other words and sounds until the pupils can pronounce words quite readily.

As the different sounds of the same letter are presented, we must introduce a notation to indicate the sound of the character, and also show how the silent letters are represented. Use at first, also, only words of simple and regular formation, omitting such words as *tongue*, *thought*, *knife*, etc.

General Suggestions.—We should teach the short sounds of the vowels first, as *a* in *at*, *e* in *en*, *i* in *in*, *o* in *on*, *u* in *us;* and the simple consonants, as *b*, *d*, *f*, *l*, *m*, *n*, *p*, etc. We should then drill the pupil in pronouncing their combinations in words of two letters, as *an*, *at*, *in*, *ox*, etc. Then words of three letters may be given, as *fan*, *bat*, *bit*, *box*, *fox*, etc. We should then introduce some of the other sounds of the vowels, as $\bar{a}$, $\bar{e}$, $\bar{\imath}$, $\bar{o}$, etc., indicating them by the proper notation, and combine these with the characters already given. Next show how silent letters are represented, and introduce such words as cān*e*, rāt*e*, fāt*e*, māt*e*, fīn*e*, līn*e*, etc.

The teacher may use the blackboard in teaching pronunciation with great advantage. Let him write the letter *a* on the board, and have the pupils give its sound; then place the letter *t* after it, and have the pupils give its sound, and also the sound of the combination *at;* then place the letter *b* at the left, have the pupils give its sound and the sound of the combination *bat.* Then erase the *b* and substitute each of the consonants *f*, *r*, *m*, *n*, *s*, and *v* in its place, and require the pupils to pronounce the word. A similar exercise may be had on other combinations.

To aid the pupils in learning new words, columns of similar words may be written on the board so that the pupils may see their pronunciation partly by the *analogy of words.* Thus:

cat	in	car	ten	bit	gun
rat	tin	far	hen	fit	fun
hat	pin	tar	pen	pit	run
fat	fin	mar	fen	sit	sun.

They may also be arranged so that the *common* element may be seen and readily joined with the *different* single elements. Thus, take the combinations *at*, *an*, *ot*, *og*, and *ill*, which we suppose the pupils have learned, and combine them with the different consonants, as is indicated below.

	b-at		c-an		c-ot		b-og		b-ill
	c-at		f-an		h-ot		c-og		h-ill
at	f-at	an	m-an	ot	l-ot	og	d-og	ill	m-ill
	h-at		p-an		n-ot		f-og		t-ill
	r-at		r-an		p-ot		l-og		k-ill

Classes of words may also be selected which have the common element first, as, *cat*, *can*, *cap*, *cab*, etc. These words could be grouped in books or on cards, or may be written on the blackboard. The method of using such exercises is so evident that we need not describe it. It is remarkable how soon children acquire the sounds of letters, both consonants and vowels, and when this is done, they have the key to reading in their hands.

It would be well to have words arranged in columns in the reader or spelling-book, classed according to their analogies of sound, with the character or combination of characters used to represent the sound placed at the head of the lesson to serve as a key to the pronunciation. Thus *a*, as in *late*, would indicate the sound of such words as *aim*, *they*, *nail*, *steak*, *gauge*, etc.; or *sh* in *ship* would be the key to the pronunciation of words which contain the combinations *ti*, *si*, *ci*, *ch*, *ce*, *se*, *sch*, etc.

The pupil should also have plenty of exercise in forming new words by combining the sounds of the characters as already explained. The small letters are, of course, to be taught first. The pupils should be required to write the letters and the words on their slates and on the blackboard.

After the pupils have learned to read by the word method and the phonic method, I should have them name the letters of words, and pronounce the words. This was the old method, and pupils will find it convenient to be able to name the letters of words, though the names of the letters will not enable them to pronounce the word.

It will thus be seen that the true order of teaching a child to read is,—*first*, *the object or idea ; second*, *its sound symbol*, or spoken word; *third*, *the form symbol*, or printed word; *fourth*, the elements of the spoken word, or the *elementary sounds; fifth*, the elements of written words, or the *letters* representing the elementary sounds; and, *sixth*, the *synthesis of these sounds*, as the pupil sees the letters united in the printed words. Subsequently, the pupil may be taught to represent the words by writing them on the slate or blackboard. This is the true, simple, and natural method; and this order of learning to read the language will correspond with the order of using it. Words, then, will become as mirrors reflecting objects and ideas to the minds of pupils. *Sense* and *sound*, and *form* and *use*, will become so intimately blended together that pupils may easily be led to use conversational tones in reading, and a natural style of expression will follow as a natural result.

In this work of instruction, the teacher may use *Books*, or *Reading Cards*, or the *Blackboard*. Each one of these has its own peculiar advantages; and in actual instruction it will be best to combine the use of them all. Every primary school should be supplied with a set of Reading Cards, and the teacher should practice until he can write the words neatly on the board. The pupils should also be taught to write words on the slate and blackboard. The use of script letters is proposed as they are more easily read; and pupils have no difficulty in making the transition from the script forms to the printed forms. Some teachers may prefer to have their pupils print the words on the board rather than to write them in script letters; but this will not change the character of the method we have suggested.

CHAPTER III.

TEACHING THE ALPHABET.

IN teaching a child to read, we have used the letters as representing sounds, though we have not called attention to their form or their names. The next step is to make a child familiar with the forms and names of the letters. Since some knowledge of the origin and nature of the alphabet will be interesting to teachers, we shall divide this chapter into two parts; the *Nature of the Alphabet* and the *Methods of Teaching the Alphabet.*

I. THE NATURE OF THE ALPHABET.

Definition.—The Alphabet is a system of characters used to represent the elementary sounds of a language. The term *alphabet* is derived from *alpha* and *beta*, the first two letters of the Greek alphabet. It comes to us from the Latin *alphabetum*, which, however, it is said, occurs in no prose writer before Tertullian, though it is presumed that the word had previously existed.

Origin.—Our alphabet was derived from the Latin, which was derived from the Greek, which, it is supposed, was derived from the Phœnician, or from the Hebrew, with which it is closely allied. It is said that Cadmus, 1500 B. C., brought 16 letters into Greece; Palamedes subsequently added 4, and Simonides 4 more, which accounts for the 24 letters of the Greek alphabet.

The forms of our alphabetic characters are derived from the Phœnician letters. The origin of these primitive forms is not positively known. It has been supposed, but without authority, that they originally represented the shape of the mouth in making the sound. It is now generally believed by those who have investigated the subject, that they are modifications of the system of hieroglyphics, or picture-writing, used in Egypt. The Phœnicians probably took the Egyptian characters, which were symbols of words, and changed them into symbols of sounds.

Greek Changes.—In adopting the Phœnician alphabet, the Greeks made many considerable changes in the values of the symbols. Several of them were unnecessary, for they had no sounds in their language to correspond with them, and they were dropped. The Phœnicians had no proper vowels; the Greeks therefore employed as such those letters which were nearest akin to vowels; A, E, F, H, I, and O. To the Phœnician alphabet the Greeks added the aspirates Φ and X, the double consonant Ψ, and the sign for long *o*, Ω, placing these new letters at the end. To distinguish these, the short *o* was called 'Ο μικρόν, *small o;* and the long *o*, 'Ω μέγα, *great o*. A few other changes were made, which we cannot here notice. The Greek alphabet, in its complete form, was first adopted by the Ionians. It was first used in Attic inscriptions in the archonship of Euclides, 403 B. C.

Latin Changes.—The Latins also introduced many changes, as (1) in the use of the symbol (F) *vau*, to denote not the *v* but the *f* sound, which was probably strange to the Greeks; (2) in allowing K to fall almost out of use, and employing C instead; (3) in forming a new symbol G, *i. e.*, C with a distinguishing line, to mark the soft gutturals, about the 3d century B. C.; (4) in the addition, in the 1st century B. C., of the two symbols Y and Z after X (which had long been the last letter of the alphabet), to express the Greek sounds *v* (upsilon) and *z* (zeta).

English Changes.—The alphabet, as derived from the Latin, has been somewhat modified in the English language Thus I and J, which were at first merely graphic variations, were changed by the Dutch printers during the 16th and 17th centuries, to represent different sounds. The letters U and V, which were formerly used indiscriminately to represent the same sound, acquired separate uses about the same time. W was added some time during the Middle Ages. It is a combination of two V's, the letter *v* being formerly called *u*, which accounts for the name "double u."

Order of Characters.—When, by whom, and why the letters of the alphabet were arranged as we now have them, cannot be explained. The present arrangement has given rise to much ingenious speculation. It has been supposed by some that there are traces of regularity in the present order. Thus, the three soft momentary sounds *b*, *g*, *d* were placed together; *p*, *k*, and *t* may have once been together and separated by later intrusions; *l*, *m*, and *n* have an affinity indicated by the name *liquids*, etc. It is hardly probable, however, that the symbols were arranged upon any scientific method; but that chance guided the general arrangement, though a few sounds obviously similar may have been put together intentionally.

Names of Letters.—The Romans also changed the Greek names for the characters of the alphabet. The vowels were known by their sounds only. The momentary consonants and *h* were denoted by their own sound followed by a vowel; as, *be*, *ce*, *de*, *ge*, *pe*, and *te*, and also *ka* and *ha;* *q* had sufficient vowel sound to float it alone; on the other hand, the continuous consonants were preceded by a vowel; as, *ef*, *el*, *em*, *er*, *es;* and *x* was called *ix*.

This difference in the method of naming the consonants was obviously caused by their nature. Momentary sounds are produced by a complete closure and opening of the organs required in each case; when this opening is made, the organs are so placed as to form a vowel, which is naturally produced by the remnant of sound required for the consonant; whereas a vowel cannot be produced before any one of these sounds without conscious effort; hence it is simpler to call *k*, *ka*, than to call it *ak*. The continuous sounds, however, are produced with the organs slightly open, in which case a certain amount of vowel sound tends to escape just as the organs are drawing together to produce the consonant, and is thus heard before it; but to sound a vowel after one of these consonants, the organs must intentionally be put in the proper position. Thus, the same principle—the conscious or unconscious striving for ease of articulation—produces opposite results in the case of the momentary and continuous consonants.

The same principle caused a different vowel to be used for *h* and *k*, from that which is used for the other letters. In sounding the letter *a* (*ah*), the organs are in nearly the same position as in sounding these two gutturals, only a little more open; whereas the position for sounding *e* (*ay*) is more nearly that of all the other consonants. The sound of *e*, as here used is *ay*, and of *a*, is *ah*, which, it is supposed, was the Latin sound, thus a Roman would have spoken of learning not his *a-bee-see*, but his *ah-bay-kay*.

Classification.—The letters of the alphabet have been classified with respect to their history, as follows: (1) B, D, H, K, L, M, N, P, Q, R, S, and T, letters from the Phœnicians; (2) A, E, I, O, Z, originally Phœnician, but changed by the Greeks; (3) U (same as V) and X, invented by the Greeks; (4) C and F, Phœnician letters, changed in value; (5) G, of Latin invention; (6) Y, introduced into Latin from the Greek, with changed form; (7) J and V, graphic Latin forms varied to independent letters; (8) W, a recent addition, formed by doubling U or V, whence its name.

Capitals and Small Letters.—In ancient Greek writing, the capital letters were principally used, and with no division marked between the words. The small cursive character was introduced during the eighth century, though the introduction must have been gradual; for, in the oldest Greek manuscripts, even as early as the fifth century, they appear intermixed with capitals.

Vowels and Consonants.—The Phœnician alphabet consisted of 28 letters, none of which were vowels. They employed hardly any vowel signs. In Hebrew, the three principal sounds, *a*, *i*, *u*, were sometimes expressed in writing, and long *i* and *u* were denoted, not by special signs, but by consonants akin to them; *a* was regularly omitted except at the end of a word, where it was denoted by *He*, and sometimes by *Aleph*. In fact, in all Semitic languages, the practice was to ignore vowels in writing, leaving it to the reader to fill, according to the context, the unvarying framework of consonantal sounds. The Hebrew vowel points were a later invention, rendered necessary when the language ceased to be spoken.

Direction of Writing.—The direction of writing varied among the different nations of antiquity; but in general the Semitic races wrote from right to left and the Aryan from left to right. The early Greeks, like the Phœnicians and other eastern nations, originally wrote from right to left. Subsequently they wrote consecutively from right to left and left to right, as land is plowed, the writing being called *furrowed writing*. This method was continued for a long time; the laws of Solon, promulgated 594 B. C., were written thus; and it was used until the fifth century B. C. Writing from left to right was introduced, however, before the alternate method was abandoned; inscriptions dated 742 B. C. have been found written from left to right; and Herodotus speaks of the method of writing from left to right as the established custom of the Greeks in his time.

The Chinese and Japanese write in columns, beginning at the top and passing from right to left. The Mexican picture-writing was also in columns, and read from the bottom upward. The Egyptian hieroglyphics are sometimes without any arrangement, but are generally written either in columns or horizontal lines, according to the shape of the surface to be inscribed. The cuneiform inscriptions are always from left to right.

II. Methods of Teaching the Alphabet.

After pupils have learned to read little sentences, and have analyzed spoken words into their elements, the elementary sounds, and written words into their elements, letters, these letters and their names are to be taught; and we will now proceed to consider the ways in which it may be done.

It will be noticed that there is a difference between knowing the letters and knowing their names. In teaching children the sounds of the letters before their names, they will have become familiar with the forms of the letters before they know what to call them. Indeed, if they were asked their names, they would no doubt give the sound of the letter as the name of it.

The Methods.—The alphabet may be taught with a Book, with Cards, and with Slate and Blackboard. Each of these methods has its advantages, and they may all be used by the teacher.

With a Book.—The old method of teaching the alphabet was to begin at A and, the teacher pointing with a knife or pen, have the pupil go all the way down to Z, and then go back again up to A. Sometimes there would be a little "skipping around" among the letters, and occasionally an effort made to fix some particular letter in the memory of the child. Two such lessons in the forenoon and two in the afternoon constituted the entire work of the primary pupils in our public schools thirty or forty years ago; and it is said that this method is not yet obsolete. It often required several months for the pupil to learn all the letters when taught by this method. Pupils were frequently known to be able to repeat all the names of the letters in their order without knowing the letters to which the names belonged.

The correct method, in teaching with the Book, is to select some of the most easily remembered forms, as *o*, *x*, *i*, etc., call attention to the peculiarities of their form, and thus impress them and their names on the memory. Teach a few letters the first day, review these and add a few more the next day, and thus continue until all are learned. In this way the entire alphabet can be taught in a very few days.

An advantage of the pupils having books is that they may have them at their seats, and look at the letters when not reciting, and thus become familiar with their forms. They may thus also print the letters from their books on their slates, which will impress their forms. Another advantage is that they may take their books home and get some instruction from their brothers and sisters or their parents. An objection to the use of the book, as compared with the use of cards, is that it does not admit of classification; only one or two can thus recite at a time.

With Cards.—We may also teach the alphabet by the use of Cards. To teach by this method we need a set of cards. These cards should be large, containing letters printed on them in large type. The first card of the set should have some of the more easily learned letters, as O, X, S, etc., printed near its centre, and the same letters in connection with others in the margin. The next card should contain more new letters in the centre, and these and those already learned be combined with others in the margin. The letters should also be combined in words, both near the centre of the card and in the margin of it.

The teacher will call attention to some letter, as *o*, talk about it, awaken an interest to know its name, and then give the name and have the pupils repeat it. Do the same with another letter and another, until he has taught as many in one lesson as he thinks the pupils can remember. He may then send some one to the card to point out the letters as he names them; or he may have the class name them as he points them out.

He may then have the pupils search for some of the letters in the margin of the card where they are mixed with other letters. A little competitive trial of skill may be had to see who will find the most letters in the margin. Such an exercise Dr. Wickersham describes under the head of "hide and seek" with letters. A high degree of interest can be aroused in this way.

The advantage of the Card Method is that it admits of classification. A dozen or more can recite at the same time. It also excites a deep interest on account of its allowing a competitive trial, which makes the lesson attractive and aids in fixing the forms and names in the mind. It has the disadvantage, compared with the Book Method, of not being accessible to the children at their seats or at home. It should be used in connection with the book method.

Slate and Blackboard.—The Slate and Blackboard may be used in teaching the alphabet. In teaching the letters in this way, the teacher should go to the board and print the letter neatly upon it; and, calling attention to the peculiarity of its form, as before suggested, show the pupils how he makes it, and give them its name. He should then require the pupils to make the letter upon the slate or blackboard, correcting their errors, and showing how to improve its form. He should proceed in this way with all the letters, beginning as before with the most easily remembered.

There are several letters which it is difficult for pupils to distinguish from one another, that may be best taught by this method. The principal of these, among the small letters, are *b*, *d*, *p*, and *q*. These letters may be divided into two parts, called the *curve* and the *stem*. The teacher may draw a stem on the board, and put the curve first in one place, and then another, now at the lower right hand corner, then at the lower left hand corner, etc., requiring the pupil to give the name of the letter thus formed. The blackboard can also be advantageously used in teaching pupils to distinguish such letters as *c* and *e*, *n* and *u*, etc.

One advantage of the slate and blackboard method is that the drawing of the form impresses the form on the mind. Another advantage is that it affords pleasant employment for the pupils when at their seats. In order to have them draw when not reciting, the teacher may print large letters on the board for them to copy, or they may copy from their cards or their books.

General Remarks.—Children at home may have blocks with the letters on them; but these will not be found very convenient in a public school. A Reading Frame, consisting of an upright frame on which strips are fastened, forming grooves in which blocks containing letters may be placed, is also recommended, and may be used in a primary school with advantage. It is not needed, however, in an ordinary public school.

Should the small letters or the capitals be taught first? The old custom was to teach the capitals first; but it is now thought that the small letters should be taught before the capitals. This is almost a necessity, if we teach pupils words before letters, and analyze words into their letters, as words in their ordinary form are printed in small letters. But even if letters were taught before words, the small letters should be taught first, since we should immediately unite the letters into words. Besides this, when pupils are taught the small letters, they will learn the capitals almost without any instruction.

Finally, remember that the pupils should be taught to repeat the letters in their proper order. This will be needed in consulting the dictionary, and for many other purposes.

CHAPTER IV.

TEACHING PRONUNCIATION.

PRONUNCIATION consists in the correct utterance of words. The term *pronunciation* is derived from *pro*, forth, and *nuncio*, I announce; and means, literally, a speaking forth.

Words may be pronounced upon seeing the characters which compose them, or upon hearing uttered the names of the characters, or the sounds represented by the characters. In reading, we pronounce words upon seeing the characters which compose them. If the letters of a familiar word be named to us in their order, or if the sounds of any word be thus given, we can pronounce the word.

I. Nature and Importance.

The pronunciation of the English language, like that of all living languages, is in a great measure arbitrary. It is liable to change from one age to another; and varies in different countries where it is spoken, and in different divisions of the same country. Even people of the same place differ in the pronunciation of many words, influenced by the caprices of fashion and taste.

The standard of pronunciation is the present usage of lite rary and cultivated society. In England, the usage of the best society of London is regarded as the principal standard, though the usage of good society in that city is not uniform We have no one city in this country which holds a corresponding rank as a centre of intelligence and fashion, and thus no special standard of usage to govern us. American scholars are, however, largely influenced by English custom.

A standard dictionary should aim to present the best usage of the present time. The standard, therefore, for students, is the standard dictionary. The standard dictionaries of this country are Webster and Worcester. Where they agree, we have a guide which we may follow with entire confidence. Where they differ, we must decide by the custom of the best speakers that we hear, or by other information that we may possess. Of course, we have excellent authority for our usage, if we follow either one of these dictionaries.

It is a good rule not to differ from those with whom we associate any further than correct usage actually requires. It seems like an affectation to use a pronunciation different from our associates, when theirs is also supported by good authority. For an American to say *either* (*i ther*) and *neither* (*ni ther*) in society when these words are pronounced according to the usual custom *e ther* and *ne ther*, is an inexcusable affectation. We should always remember, also, that though our own pronunciation is right, another person's may not be wrong when it differs from ours. The pronunciation of words is not a matter of absolute right, but of taste and culture.

The pronunciation of the English language is very difficult. This difficulty arises partly from the irregularity of our orthography, and partly from the carelessness of persons in respect to pronunciation. Many persons pronounce incorrectly a large number of the words they use in ordinary conversation; and very few persons can read a page of an ordinary book without several mispronunciations. Indeed, it is an exceptional thing to listen to a public speaker who does not make many mistakes of this kind in an hour's address.

The correct pronunciation of words does not receive the attention which its importance demands. Men who would blush at a mistake in grammar, or feel deeply mortified at the misspelling of a word, go on, year after year, mispronouncing many of the ordinary words, with apparent indifference, and with no effort at correcting their mistakes. Such mistakes as *i'dea* for *ide'a*, *complex'* for *com'plex*, *in'quiry* for *inqui'ry*, and the incorrect sounds of the vowel in such words as *food*, *root*, *half*, *past*, etc., we hear constantly made by educated men, who thus show their lack of literary culture and refinement.

Correct pronunciation is of even greater importance than correct spelling, since we make constant and daily use of spoken words, while we write much less frequently. A misspelled word is an offence to the eye, but a mispronounced word is an offence to the ear; and the ear is as delicate and refined as the eye. It should be regarded as less displeasing to see a misspelled word in a person's letter than to hear a mispronounced word in his conversation or speech.

Teachers should be especially particular in respect to pronunciation. They should be careful that they pronounce correctly as a model for their pupils to imitate. They should make constant efforts to correct the mistakes of their pupils, and to train them to pronounce correctly. It is not sufficient that attention be called to their mistakes; but pupils should be drilled on the mispronounced words until they have acquired the habit of pronouncing them correctly. Pupils should be required to keep a list of the words which they mispronounce, and be frequently drilled upon them.

II. Methods of Teaching.

There are two distinct methods of teaching the pronunciation of words, called the *Associative Method* and the *Phonic Method*. Both of these have already been referred to in teaching a child to read; they will now be discussed more fully.

The Associative Method.—The *Associative Method* consists in teaching the pronunciation of words by leading the pupil to associate the name of the word with its form. This is the method by which we begin to teach a little child to read. The pupil sees the word, the teacher gives its name, and the pupil is required to associate the name with the form and remember it, just as he learns the name of any other object. In this way a child learns to pronounce words before it knows its letters.

This is the correct method for the beginner. First, it is the natural method; it is the same way in which we begin spoken language, and in which we learn the names of other objects. It is also the most interesting method; for a young pupil is more interested in words than in abstract characters. It is the most philosophical method, for it proceeds *from the known to the unknown*, from the known spoken word to the unknown written word. It is also the historic method; for written language employed symbols for entire words before it used letters; and the historical order of development generally indicates the true order for the child.

The associative method, however, has its limitations. The pupil can pronounce only the words which have been pronounced for him. Each new word must be named for him before he can pronounce it. He attains no knowledge by which he can pronounce new words independently of the teacher. It therefore needs to be supplemented by some other method by which the pupil can learn to pronounce new words for himself. This method is the Phonic Method, which we shall now consider.

The Phonic Method.—The *Phonic Method* of teaching pronunciation is that by which we teach pupils to pronounce words by combining their elementary sounds. By this method we first teach the pupils the elementary sounds, then the characters which represent these sounds, and then lead the pupil to combine the sounds in their order as he sees the letters.

Were the English language phonetic, this method would be entirely simple and easy. Having learned the sounds and the characters representing them, the pupil would be able to pronounce, with a little practice, any word he might see. A language is phonetic when it has a character to represent each elementary sound, when each elementary sound is represented by but one character, and when words are spelled as pronounced and pronounced as spelled. The English language is not phonetic; hence this general method becomes somewhat modified in its application, and its difficulties are increased. We shall describe how the method may be applied to our language.

There being about forty sounds in the language, and only twenty-six characters, we have not characters enough to represent all the sounds; we are therefore compelled to adopt some notation to be used with these characters to indicate the remaining fourteen sounds. We may use figures as exponents or subscripts, or the marks in some standard dictionary. Thus, a^1 or a_1, or $\bar{a}$ might represent the first sound of *a;* a^2, or a_2, or $\breve{a}$ might represent the second sound of *a;* etc. The different sounds of the consonants may also be indicated by marks. All the primary readers should have some notation which the teacher can adopt in this instruction.

The next step in the method is to indicate the silent letters, so that the pupil may know, on seeing a word, what letters to sound and what not to sound. This may be done by printing the silent letters in a lighter-faced type as Dr. Leigh does, or in italics, as is done in many of our spelling-books and readers, or with a stroke across them, as is done in a recent series of readers. Thus the word *fate* might be printed fate or fat*e;* the word *light*, light, or li*gh*t.

Having received this instruction, the pupil will be able, with a very little practice, to pronounce all new words that he meets in his readers. All that he must do to pronounce a word is to give the elementary sounds, as indicated by its letters, in the order in which they occur in the word, being careful that they flow naturally and musically into one another. After he is familiar with words printed in this way, he will experience little difficulty in recognizing them when printed in the usual form.

The sounds of the letters may also be indicated by using the diacritical marks of the dictionary. This method has been used by many teachers with great success. It has been very thoroughly and successfully tested in many of the schools of the country. If the primer or primary reader used in the school has no marks, the teacher can mark the words neatly with pen or pencil. Nearly every series of readers now published in this country has a system of marks to represent the sounds, and the teacher can adopt the system of the books he uses.

In favor of the Phonic Method, we remark that it is natural, philosophical, and practical. It is not a mere theory; it is a method of great practical value. It is not an untried experiment; its utility has been demonstrated by the test of our best teachers. No intelligent teacher who adopts it will ever discontinue its use; and it is difficult to see how a teacher can be intelligent who has not adopted it. The indications are that it will soon be universally adopted in this country.

Other Methods.—There are several other methods that have been used in teaching pronunciation, the most prominent of which are the Alphabetic and Phonetic Methods. Besides these there are several modifications of the Phonic Method, in which special forms of letters are suggested, which may be included under the general name, Typographic Method.

Alphabetic Method.—The *Alphabetic Method* is that in which the teacher attempts to teach pronunciation by having the pupils call the names of the letters. Thus in the word *fight*, the teacher has the pupil say *ef*, *eye*, *ge*, *aitch*, *tee*, and then pronounce the word *fight*. The thought was, if there was any thought on the part of the teacher, that the naming of the letters of a word would enable the pupil to pronounce the word.

This method was formerly the only one used in our schools. Nearly every adult of the present day was taught to pronounce words in this way. The method, however, is an absurdity. No one ever actually learned to pronounce words in this way, though teachers have attempted to teach in this way. Children who were required to learn in this way, actually learned by association and the phonic principle. They heard the teacher pronounce the words several times, and remembered the pronunciation, associating the name of the word with its form. They also unconsciously acquired a knowledge of the powers of the letters, so that when they saw them or named them in words, they knew what their powers were. They were often guided also by analogy in pronouncing similar words.

The objection to the method is that the name of the letter is not its sound. In many cases, the name not only does not suggest the sound, but bears no relation to it. How, for instance, can any learner know that the sounds represented by *aitch*, *eye*, *double ell*, spell the word *hill*. If we should pronounce words by uniting the names of their letters we should have quite a different word from the one intended. Thus *me* would spell the word *em-me*, *at* would spell *eigh-ty*, *leg* would spell *el-e-gy*, *ntt* would spell *en-ti-ty*, *utk* would spell *u-ti-ca*, etc., and what the names of the letters of such words as *brought* and *phthisic* would spell, we leave to the ingenuity of the teacher who still uses this method. A method so evidently absurd should no longer find a place in our schools.

Rev. Thomas Hill, one of the most eminent educators of the age, says: "In teaching a child A, B, C, and impressing on his mind that these letters spell the words of the language, you teach him a falsehood and give him little chance to detect the cheat. I say, so far from helping him to read, you have put a formidable obstacle in the way of his learning to read. The letters do not spell the words, and therefore the knowledge of the letters does not aid him in reading the words; they do spell something else, and therefore are an actual hindrance in learning to read."

Dr. Currie apologizes for those who use it, saying that "it is not designed to be a reading method alone; but a method for teaching reading and spelling simultaneously, and the reading through the spelling." He also says, "It does not pretend to be a phonic method," etc. "Very much of the argument against the common method has proceeded on the false assumption that the letter-*names* of a word and its sound are set forth in the relation of phonic parts to their whole; and has therefore not touched the merits of the question." It is clear, however, that most teachers who used this method did so to teach their pupils to pronounce words, for it was a common thing, when a child came to a word in his reading lesson which he could not pronounce, for the teacher to tell him to "spell the word."

Phonetic Method.—Another method, formerly used to some extent, is that which has been called the *Phonetic Method*. This method is the same in principle as the Phonic Method; it differs from it in introducing about fourteen new characters instead of using a notation; and also in using only the letters in spelling a word, which are sounded in it.

In teaching by this method, the elementary sounds were taught, then the twenty-six letters as representatives of twenty-six of these sounds, and then about fourteen new characters to represent the remaining sounds. Then pupils were taught to combine these characters into words, using only as many characters in spelling a word as there are elementary sounds in it. Thus, the word *light* would be printed *lit; bear*, *bar*, etc. These words could of course be readily pronounced by the pupil.

Pupils were then required to make the transition from words in their phonetic forms to the common forms. This was done by having words in the two forms printed in parallel columns, so that the comparison could be readily made. The word in the phonetic form was thus a sort of key to the pronunciation of the word in its ordinary form. This method, though once popular with a certain class of teachers, is now obsolete

III. Correct Pronunciation.

Having shown how a child may be taught to pronounce words, we pass on to consider the art of correct and artistic pronunciation. Correct pronunciation includes two things; *Articulation* and *Accent.* Every mistake made in the pronunciation of a word is an error of either articulation or accent.

Articulation.—The basis of Pronunciation is Articulation. The voice must be moulded into the elementary sounds of the language, as a primary condition of expressing words. This moulding of the voice is called Articulation. Articulation is the special characteristic of human speech and of mankind. Man is the only animal that can make and combine articulate sounds.

Nature of Articulation.—Articulation is the correct and distinct utterance of the elementary sounds of the language. The term is derived from *articulus*, a joint, an articulate sound being literally a jointed sound. Articulation differs from Pronunciation as a part from the whole; for while the latter refers to the utterance of the entire word, the former has reference to the utterance of the elementary parts of a word. The term Enunciation, from *e*, out of, and *nuncio*, I announce, is used by some writers as synonymous with Articulation, and by others as meaning the utterance of the elementary sounds as combined in words.

There are about forty elementary sounds in the English language, though orthöepists are not agreed with respect to the exact number. Some vowel sounds, which are regarded as simple by one writer, are shown by other writers to be a combination of two simple vocals. Webster and Worcester give about forty distinct sounds, and this is sufficiently correct for all practical purposes.

These elementary sounds are made by the organs of the mouth and throat, called the Organs of Speech. The organs of speech may be regarded as a set of flexible moulds which give form to the voice which flows into and through them. Any imperfection in the moulds or their arrangement will tend to impair the articulation. In order to articulate correctly, a person must possess a complete control over these organs, so as to be able to mould the voice that comes up from the larynx into all the possible forms required.

In the standard dictionaries all the sounds of the language are presented, and the diacritical marks which indicate them. The slight shades of difference between the sounds of some of the vowels, when occupying different places, and their modifications by being associated with other letters, are also explained. All of this knowledge is of great importance to teachers, and should be thoroughly mastered by them.

The importance of correct articulation is very great. It is the basis of accurate and finished utterance. A correct and artistic articulation will sometimes atone for a bad voice. The secret of the power of Randolph's oratory, it is said, lay in his articulation, for his voice was creaking and disagreeable, but by culture it "became so fascinating" that it "haunted the hearer like the spell of an enchantress."

Artistic articulation is capable of producing deep and vivid impressions on the listener. A speaker in uttering the expression "the hiss of a serpent," by slightly prolonging the final sound of *hiss* so touched the imagination of one of his hearers that it led to a vivid dream of a serpent. Prof. Thwing mentions a speaker who just before his departure for the Pacific coast, in an address spoke of "the wash of its waves," and by giving a slight fullness to *sh*, made an impression on his mind that he says he has never forgotten.

METHODS OF TEACHING.—Correct Articulation is taught in three ways: by *Imitation*, by *Phonic Analysis*, and by *Correcting the Errors* of pupils.

Imitation.—The pupil learns Articulation principally by imitation. The child will naturally speak like his parents and companions. If their enunciation is pure and correct, his will be pure and correct also; if theirs is incorrect, his will also be incorrect. Pupils will also imitate their teacher; he should therefore be exceedingly careful that he presents a model of correct and elegant enunciation.

Phonic Analysis.—Pupils should also have daily drill on the elementary sounds. The ear thus acquires a correctness and delicacy of perception, and the organs are trained to give accurately, promptly, and with ease, all the sounds of the language. Especial drill should be given upon the more difficult sounds and those we are most liable to get wrong. Words should be given for the pupils to analyze into their elementary sounds. Such a drill has been called *Phonic Analysis.*

Phonic Analysis should receive the careful attention of the teacher. It is the foundation of all distinct articulation and correct pronunciation. Many of the faults of pronunciation, so frequently met with, may be prevented or removed by persistent drilling on the elementary sounds. Phonic Analysis should include an exercise on the vocals, subvocals, and aspirates, by themselves and in combination. Great variety can be given to the exercises, and a very great degree of interest aroused in the subject. Phonic analysis should not be restricted to the lower grades, but should constitute a part of the instruction in reading or elocution in every stage. The vocal organs need constant technical exercise, like the fingers of a pianist or violinist, that they may perform their offices with ease, accuracy, and artistic excellence.

Care should be taken to correct the errors of omission, as well as those of commission. We often suppress sounds as well as make incorrect ones. The ear should be trained to distinguish all the finer shades of difference in sounds; and the organs of speech should be carefully trained until they are able to produce promptly and with ease all the sounds of the language, in all their varied and complex combinations. And this can best be attained by the exercises in *Phonic Analysis.*

Words and sentences containing difficult combinations should be repeated. Take such words as *strength*, *shrubs*, *stretched*, etc. Practice also uttering difficult sentences, such as "She sells sea-shells," "I saw six slim saplings," "There were three gray geese and three gray ganders," "Around the rugged rock, the ragged rascal ran." Pupils may be required to repeat the well known combinations, "Peter Piper" "Theophilus Thistle," "Amidst the mists," etc. A drill of a few minutes each day on such exercises will be found to be of great value to pupils. The words should be repeated as rapidly as they can be spoken with distinctness. Such a drill can be given to each reading class, or the entire school may have an exercise for two or three minutes once or twice a day.

Errors of Articulation.—There are several special defects in articulation, the most prominent of which are *Stammering*, *Lisping*, and *Bad Habits*.

Stammering.—Stammering is a hindered or obstructed utterance of words. It is due to various causes, which should be understood, in order to overcome it. Sometimes it is the result of some peculiarity of the vocal organs, and can be cured by speaking with a marble or pebble in the mouth. Demosthenes is said to have overcome a defect in enunciation by declaiming with pebbles in his mouth.

Sometimes stammering is merely a habit acquired by associating with companions who stammer. Sometimes it is the result of rapid and heedless talking. Sometimes it is the result of an exuberance of feeling, as persons often stammer when excited or angry. In these cases, care on the part of the pupil to speak slowly and with deliberation, will be sufficient to overcome the habit. Sometimes stammering is due to timidity on the part of a nervous or sensitive pupil, in which case the teacher should endeavor to give him confidence in himself, and make him feel at ease.

More frequently, stammering arises from some peculiarity of the nervous system, either natural or the result of disease.

The great remedy in such cases is speaking slowly. We have known persons to be cured by practicing talking "to time," beating time with the finger and speaking their words at measured intervals. The nervous system seems to respond to the rhythmical movement, as is seen in the fact that persons who stammer when they talk or read, will not stammer in singing. For the same reason it will be found that pupils who stammer read poetry more easily than prose. Another suggestion is that the pupil accustom himself to a clear idea of what he is to say before he begins to speak. Deliberation and confidence are essential elements of a cure in nearly every case. An intelligent common school teacher can usually cure the most inveterate cases of stammering, if he will persevere in the attempt, and is able to secure the assistance of the pupil.

Lisping.—Lisping is mainly the use of the sound *th* for *s*. It is a habit found more frequently among girls, as stammering is more frequent among boys. Sometimes it is a mere affectation of speaking, in which case it can be cured by showing the pupil how it mars the speech, and perhaps by using a little judicious ridicule.

More frequently, lisping is a natural defect of enunciation, caused by some peculiarity of the organs of speech. Occasionally it is due to the tongue being a little large, or a little too long. A person will sometimes lisp, also, when the front teeth are very large or very prominent. To correct the habit, in these cases, the pupil must first be led to notice the defect in his articulation; a person sometimes lisps and is not aware of it. The pupil must then be shown the positions of the organs in making the sound of *s*, and the sound of *th*, and be carefully drilled on these two sounds, and then on words containing the sound of *s*, until they can be correctly pronounced. It often requires persistent practice to overcome the defect, but it should be continued until cured.

Bad Habits.—Pupils often acquire the habit of incorrect or imperfect articulation by carelessness in talking, or by the imitation of incorrect forms of speech common in their neighborhood. Such words as *which*, *where*, *when*, etc., are very generally mispronounced by omitting the sound of *h*, which, though written after the *w*, is sounded before it. The words *shrub* and *shrink*, pronounced *srub* and *srink*, illustrate the same error. Final *ing* is often abbreviated to *in;* as *nothing*, *something*, etc., called *nothin*, *somethin*, etc. There are hundreds of such errors, which teachers should notice and try to correct.

Some of the most common errors of articulation found in the public schools of several States are those which arise from the early use of the German language. We call attention to some of the most prominent of these errors. Pupils confound the *s* and *z*, calling *is*, *iss* instead of *iz; his*, *hiss* instead of *hiz*, etc. They confound *v* and *w*, saying *wine* for *vine*, and *vine* for *wine*, etc. They confound *s* and *th*, saying *wis* for *with*, *sin* for *thin*, *thick* for *sick*, etc. They confound *ch* and *j*, as *jurch* for *church*, *chug* for *jug*, *Chon* for *John*, etc. They confound *d* and *t*, as "*town* the hill" for "down the hill," and "I can't *to* it" for "I can't do it;" they confound *d* and *th*, as *den* for *then*, and even *b* and *p* as *bray* for *pray*, *prick* for *brick*.

In New England there is a peculiarity of pronunciation which consists in adding the sound of *r* to the end of words ending with the Italian sound of *a*, as *idear*, *arear*, etc. At the same time, there is a tendency to omit the sound of *r* at the end of words; as, *watah* for *water*, *daughtah* for *daughter;* and to omit or soften the *r* in other places; as *New Yawk* for *New York*, etc. This peculiarity reminds one of the Englishman's trouble with his *h*'s, his tendency being to use the *h* where it does not belong, and to omit it where it does belong, saying *'ouse* for *house* and *hobject* for *object*. Many other States, though not presenting so striking a peculiarity as the New Englander's *r*, have much more serious defects in the articulation of their people.

To overcome these bad habits, two things are required.

First, the pupil must be led to perceive that he makes the mistake; the ear must be trained to detect the difference of the sounds, and to notice when the incorrect one is given. Second, the pupil must be taught the position of the organs in making the sounds, and be drilled upon them until he can make them at his will. Then it will require constant attention on the part of both teacher and pupil in order to break away from the old habit and acquire the new one.

Besides these special errors, there is a class of general ones that demand notice. The word *and* is badly abused in pronunciation, often being passed by "with merely an uncourteous nasal salute." The terminations *ness* and *less* are often changed to *niss* and *liss*, *ment* to *munt*, and *ow* into *er*, as *feller* for *fellow*, *piller* for *pillow*, etc. Words are marred also by the omission of sounds; as *histry* for *history*, *evry* for *every*, *reglar* for *regular*, *Febuary* for *February*, etc.

Accent.—The second condition for correct pronunciation is *Accent*. When the elementary sounds are made correctly, and the stress of voice falls on the proper syllable, the word is pronounced correctly. We shall speak of the Nature of Accent, and Methods of Teaching it.

Nature of Accent.—Accent is a stress of voice upon one or more syllables of a word. The term is derived from the Latin, *ad*, to, and *cantus*, a song, showing that accent was primarily related to singing.

Accent gives a musical element to speech, and adds to the beauty and harmony of language. The ancient languages distinguished syllables by what is called *quantity;* that is, as long and short syllables. The French language is so nearly deficient in accent that blank verse is an impossibility in French literature.

Accent is of two kinds, *Primary* and *Secondary*. Primary Accent is the stronger accent in pronouncing words; Secondary Accent is the weaker or slighter accent in pronouncing words. In some words the secondary accent is almost as strong as the primary; as, *violin*, *caravan*, *artisan*, etc. Some words have two secondary accents; as, *incomprehensibility* and *antipestilential*. The word *amen* has both syllables accented: and many compound words have a slight secondary accent, as *gain-say*, *light-house*, etc.

The primary and secondary accents are, in many cases, so nearly equal that they are frequently exchanged, the primary becoming secondary, and the secondary primary. Many words, such as *ar'tisan*, *rev'erie*, *in'valid*, etc., have transferred the primary accent from the last to the first syllable.

All words in the English language of more than one syllable have one accented syllable; and most polysyllabic words have a primary and a secondary accent. It is a general tendency of the language to place the accent on the first syllable of dissyllables, and on the antepenult of polysyllables. The exceptions, however, are so numerous, that this is not to be regarded as a rule, but only as a general tendency of pronunciation. With respect to verbs of two syllables, the tendency is to place the accent on the second syllable.

Principles of Accent.—Webster's Dictionary lays down several principles which seem to have been operative in determining the position of the accent of words, and also in changing it from a former or retaining it in its present place.

First. Derivative words take for a time, if not permanently, the accent of the original words from which they are formed. The same rule holds good with words derived from other English words by adding one or more syllables to their beginning or end; as, *improp'er* from *prop'er*, *pleas'antly* from *pleas'ant*, etc.

Second. Ease of utterance has some influence in deciding the place of accent. Thus, *accept'able* was formerly pronounced *ac'ceptable*, *uten'sil* was *u'tensil*, *dyspep'sy* was *dys'pepsy*, *subal'tern* was *sub'altern*, etc. This principle is an important one in determining the place of accent, and though many will cling to the older and harder pronunciation as marked in the dictionaries, the changes which promote ease of utterance will finally prevail.

Third. In words of two syllables there is a tendency to accent the first or penultimate syllable; as, *com'mon*, *prop'er*, *dis'cord*, etc. This principle, however, has many exceptions. It meets with a powerful counteraction from the first principle, it being natural in derivative words to place the accent on the radical part of the word; as, *confer'*, *distend'*, *amuse'*, etc. There is a constant struggle among the common people, however, to draw back the accent to the first syllable; and they being in the majority, are slowly gaining on those who are governed by the first principle.

Fourth. In words of three or more syllables, there is a strong tendency to accent the antepenult, or third syllable from the end; as in *el'oquent*, *ac'cident*, *opportu'nity*, etc. This tendency is also counteracted by that of derivation, which tends to array scholars against the mass of the people, many scholars saying *contem'plate*, *demon'strate*, etc., while popular usage is *con'template*, *dem'onstrate*, etc.

There are several other principles which influence the place of the accent. Thus, we accent a word of two syllables when used as a noun or an adjective on the first part; and when used as a verb, on the second part; as *con'vert* and *convert'*, *pro'test* and *protest'*, etc. For a fuller discussion of this subject, see Webster's Dictionary, from which these facts and principles are drawn.

METHOD OF TEACHING.—We teach the correct accent of words by *Imitation* and *Correcting Errors.*

Imitation.—The teacher should be careful to place the accent correctly in speaking his words, that his pupils may have correct models for imitation. If the teacher continually says *i'dea* and *in'quiry*, his pupils will naturally make the same mistakes. Every teacher should make it a special aim to pronounce his words correctly. He should make the dictionary a constant study, and also lead his pupils to acquire the habit of consulting the dictionary to find out the correct pronunciation of words.

Errors of Accent.—One of the most common errors in the pronunciation of words, is that of misplacing the accent. Comparatively few persons, for example, pronounce *idea* with the accent on the second syllable, or *complex* and *construe* with the accent upon the first syllable.

There is a strong tendency in this country, among the common people, to give a marked secondary accent on certain words, which properly have but one accent; as, dif′ficul′ty, cir′cumstan′ces, in′terest′ing, etc. Another custom, even more vulgar, consists in placing, in words having an unaccented initial syllable followed by an accented one, a nearly equal stress of voice on both; as in ex′act′ly, gi′gan′tic, i′tal′ic, po′lit′ical, etc. Dickens, ridiculing it in *Martin Chuzzlewit*, makes one of his characters say, "Perhaps there ain't no such lo′ca′tion in the ter′rito′ry of the great U′ni′ted States." The English, however, often go to the opposite extreme, and slur over the unaccented syllables so as to rob them of the true force which belongs to them.

The attention of pupils should be called to such mistakes, and pains should be taken to have them corrected. Pupils should be required to keep a list of the words which they mispronounce, and should be exercised on it frequently to see that they are correcting their mistakes. It requires constant care and much practice to change from an incorrect to the correct pronunciation of a word.

Teachers should also make out such a list and drill themselves daily on all words which they find they have been mispronouncing. Many of them will be surprised at the extent of the list, and at the difficulty of the task of correcting their errors. It will sometimes take months and even years to correct some old habit which has become fixed by years of incorrect practice.

The following is a brief list of quite common words which are frequently mispronounced. Let the pupil and young teacher examine this list and correct any of their mispronunciations, and use it as the nucleus of other words which they find they have been mispronouncing:

ere,	often,	area,	inquiry,	Asia,
ne'er,	soften,	vicar,	vagary,	Sinai,
food,	extol,	visor,	equation,	Alpheus,
root,	route,	gratis,	museum,	gopher,
dost,	again,	complex,	lyceum,	Arabic,
doth,	recess,	compound,	interesting,	Philippi,
bade,	depot,	construe,	illustrate,	Phenice,
truths,	carry,	extant,	contrary,	Delilah,
shew,	leisure,	gallows,	opponent,	Gennesaret,
iron,	exhaust,	cortége,	disputant,	Caucasian,
idea,	apostle,	abdomen,	vehement,	Aristobulus,
error,	epistle,	courtesy,	nominative,	Sardanapalus.

Recitations, now and then, say as often as once a week, in the pronunciation of words, will be of great benefit to pupils. There is no reason why we should not have "Pronunciation Matches," as well as "Spelling Matches," in our schools; and the teacher who introduces them will find them of great value.

Pronouncing Match.—In a Pronouncing Match, the teacher will spell the words orally or write them upon the blackboard, and assign them to the pupils in regular order, as in the spelling match, the pupils "trapping" or "going out," as may be preferred. The following method is suggested by Mr. Woodruff:—Make out three lists of words, and mark them A, B, and C. Give the list marked A to the class, and when all are "pronounced out" but one, he takes his seat as entitled to a premium. Call the remainder up again and do the same with list B, and then again with list C, thus selecting two others entitled to a premium. Then call up these three "premium pronouncers," and assign them words, the last down receiving the first prize, the second down the second prize, etc.

CHAPTER V.

TEACHING ORTHOGRAPHY.

ORTHOGRAPHY is the art of expressing the elements of words. These elements may be expressed either orally or in writing. When expressed orally, the names of the characters may be given, or the sounds which they represent; the former is the common oral spelling; the latter is called phonetic spelling. Words may also be spelled either upon hearing them pronounced, or upon merely conceiving them.

The term *Orthography* is from *orthos*, right, and *grapho*, I write, meaning literally, *to write right.* In its primary meaning it thus refers to written spelling, and this was its original use. Oral spelling is a secondary and derivative idea and practice. In its true sense, orthography is the representation of spoken language by visible signs. It had its origin in picture-writing, and has gradually passed down through the verbal and syllabic stages to the alphabetic system, our present letters being abbreviations and modifications of pictures.

I. THE NATURE OF ORTHOGRAPHY.

Importance.—The importance of orthography has been sometimes over-estimated and sometimes under-estimated. Some teachers have made it a hobby in the schools, and others have treated it with neglect and even with contempt. Its true value may be stated in a single sentence: there is no great credit in being a good speller, but there is great discredit in being a poor one. Dr. Currie gives a similar estimate when he says, "The possession procures no credit, but the want entails disgrace." Prof. March says, "Stress is laid on it as the sign of a thoroughly educated person out of all proportion to its real value." Still, correct spelling can not but be regarded as an indication of a cultivated and scholarly mind.

The attention it has received during the past fifty years has varied. Many years ago, when there were few studies in the public schools, orthography occupied a large share of the teacher's attention. The old "spelling schools" have become historic. Subsequently, when geography, grammar, mental arithmetic, etc., were introduced, orthography was eclipsed in interest, and was greatly neglected. After a while, it was seen that boys and girls were coming out of the public schools poorer spellers than their parents, and a reaction took place in favor of orthography. To-day it is receiving its just share of attention.

Difficulty.—English orthography is exceedingly difficult: it is probably more difficult than that of any other modern language. American children spend three years in learning to spell a little, while German children get further in a twelvemonth. In the civil examinations in England, out of 1972 failures, 1866 candidates failed in spelling; and it is said that the documents prepared by the prime ministers of England show that no one of them could have passed these examinations in spelling.

This difficulty is due to the irregularity of the English orthography. This irregularity consists in the use of silent letters, and in the use of different letters and combinations to represent the same sound. Many letters are pronounced in several different ways, while the letters or combinations of letters for a single sound, in some cases amount to scores Many words of no more than two syllables may be spelled in several thousand different ways, by the use of combinations actually employed in other words in the language. The word *scissors*, it is computed by Ellis, may be thus written in nearly 6000 different ways. Indeed, it may be truly said that we possess the worst alphabetic spelling in the world. English orthography is "the opprobrium of English scholarship;" it is the greatest hindrance to education and to the spread of our language.

Origin.—The irregularity of our orthography is accounted for by its history. The Anglo-Saxon was first reduced to writing by the Roman missionaries who converted the people to Christianity. They used the Roman letters, in nearly their Roman value, and added new characters for the sound of *a* in *fat*, *th* in *their* (*dh*), *th* in *thine*, and *w*. The Norman Conquest produced chaos in English spelling. The Normans and Saxons could not pronounce each other's words correctly; and in trying to spell them, confusion and uncertainty became inevitable.

Carelessness in authors and copyists also contributed to this irregularity. Before the time of printing, manuscripts show that the wildest license prevailed in spelling words. Even proper names are found recorded in a great multitude of forms, several variations being sometimes found in the same manuscript. Disraeli says that "Leicester has subscribed his own name eight different ways," and that "the name *Villers* is spelled fourteen different ways in the deeds of that family." Lower states that the family of *Mainwaring* has 131 variations of that single name, all drawn from authorized documents.

There were a few writers, however, in those early days, who were attentive to the proper form of words. The spelling of the *Ormulum*, which was written in the 13th century, though strange and cumbrous, is remarkable for its regularity; and the author urges his copyists to follow his orthography with the utmost exactness. Chaucer, also, more than a century later, carefully revised and corrected his own works; and he enjoined upon his scribe to "write more trew" that which was intrusted to him, saying that he was obliged "it to correct and eke to rubbe and scrape," because of the negligence and haste with which it had been copied. Even as late as the time of Shakespeare, orthography was very unsettled, for the name of the great poet was written more than thirty different ways.

The invention of printing contributed largely to fix the orthography of words. For a long time, however, it did but little to give uniformity to spelling. There being no standard, printers added or omitted letters, as the length of the line or convenience of spacing required. The same word was often printed in several different ways on the same page. At length the attention of scholars was directed to the subject, and efforts were made to improve and settle English orthography.

Dr. Johnson's celebrated Dictionary, published in 1755, was the first recognized standard of orthography; and it has contributed more than any work, either before or since, to fix our method of spelling. It settled usage definitely in favor of some one of the numerous forms in which words were written, and thus removed the cause of confusion. He introduced changes to restore the ancient orthography or to remove some anomaly, some of which were not adopted by subsequent writers. Among these were the restoration of *k* to many words that had been written without it; as, *musick*, *rhetorick*, etc., and the insertion of *u* in many words ending with *or*, as *honour*, *ancestour*, etc. This latter method is still used by many English writers.

In 1828, Noah Webster published his great Dictionary of the English language, in which he made many changes in orthography. These changes were of two kinds: first, to make the words correspond, as far as practicable, with their primitive forms, so as to reveal their etymological affinities; second, to reduce as much as possible the number of anomalies and special cases. Of the former class, many were restored by Dr. Webster in the second edition of his work, published in 1840; and others were restored in subsequent editions. Many alterations of the second class have been received with favor and adopted by a large number of writers in the United States, and by some English authors.

Phonetic Systems.—The irregularity of English orthography has led to many attempts for the adoption of a phonetic system of spelling. The first of these was made by Sir Thomas Smith (1568), Secretary of State to Queen Elizabeth. He was followed by John Hart (1569), Chester herald, by William Bullokar (1580), by Dr. William Gill (1619), Master of St. Paul's School, London, and in 1633 by Charles Butler, who printed a book in which his new method was employed. In the time of Charles I., many changes were introduced, and it was very common, even among eminent scholars, to spell words as they were pronounced, omitting such letters as were deemed superfluous. These attempts, however, being made upon no settled or uniform principles, had little or no permanent effect upon the language.

The attempt to reform our orthography by employing an alphabet in which each sign shall stand for one and only one sound, has been made in modern times. Dr. Franklin invented such a system, though he never brought it to perfection, and scarcely used it except in a brief correspondence with a friend. The most important systems recently presented are those of A. J. Ellis, I. Pittman, E. Jones, and A. M. Bell. Mr. Bell has invented a set of characters which indicate by their form the position of the organs of speech, being thus a system of "visible speech." Scholars have begun to use it in scientific treatises; but it can hardly meet with general adoption.

Reform in Spelling.—There seems to be a growing opinion in favor of a reform in our orthography. The leading philologists of this country and England are becoming strong advocates of it. Among these we may mention the names of March, Whitney, and Haldeman, of America, and Max Müller, Ellis, Jones, etc., of England. Many of the philological and teachers' associations of both countries, and also some state legislatures, have appointed committees to consider the subject.

The disadvantages of our present system make a change a necessity. Our system of spelling is one of the greatest hindrances to the education of our people. Children require years of study in order to learn to spell and pronounce written words, which could be learned, if we had a phonetic system, in a few weeks or months. Besides this, millions of dollars are wasted every year in printing silent letters and senseless combinations to express simple sounds.

That some change will be made, seems probable, but what form it will assume, it is difficult to tell. The essential principle of a radical change is that each sound shall be represented by a single character, and that words shall be spelled as pronounced. We should therefore take the present letters, using each for its most common sound, invent some fourteen or sixteen new characters for the remaining sounds, and then spell words as they are pronounced, using no more characters in a word than are sounded.

The objections to this, however, are many and serious. What shall be done with the vast libraries of books already printed, which will become sealed volumes to those taught by the new method? How shall we get the people to learn the new method, or to allow it to be introduced into the schools of the country? Indeed, the objections are so great as to be absolutely insuperable. It may therefore be positively assumed that no phonetic system will be adopted; and in what form a reformation will come it is at present impossible to predict.

II. Methods of Teaching Orthography.

There are two methods of teaching orthography, which may be distinguished as the *Oral* and the *Written Method*. The *Oral Method* depends upon the sense of hearing, and the *Written Method* upon the sense of sight. They have also been distinguished as the Auricular (*auris*, the ear) and the Ocular (*oculus*, the eye); but the terms Oral and Written seem to have been more generally adopted by the profession.

The Oral Method.—The Oral Method is that which teaches orthography by naming the letters of words; it is based upon the principle of fixing in the memory the letters of words in their order through the sense of hearing. It consists in memorizing the sound-order of letters, with the expectation that the association of the names will become fixed in the memory in their proper order like the words of a quotation.

The Oral Method possesses several advantages. It teaches pupils to pronounce words, which the Written Method does not. It also teaches the correct syllabication of words, which is not done by the ordinary Written Method. It also admits of several interesting methods of competitive recitation. The spelling-match is essentially an oral exercise: a written spelling-match is a dull thing, compared with the old-fashioned oral spelling-matches.

There are also several disadvantages in the Oral Method as compared with the Written Method. First, pupils taught to spell orally will not usually spell correctly when they are writing. It is frequently noticed that pupils will spell without mistake, when pronounced to them, the words which they have misspelled in a letter or a composition. This objection becomes more serious when we remember that the principal value of spelling is the ability to write words correctly. There is no particular value in spelling words orally. Another objection is that each pupil of a class cannot spell as many words of the lesson as by the Written Method.

The Oral Method, notwithstanding these objections, is the one which has been almost exclusively used for centuries. It is within a comparatively recent period that the Written Method has been introduced into our schools. Our fathers were all taught by the Oral Method, and even the majority of the teachers of the present day were trained by it.

The Written Method.—The Written Method is that which teaches orthography by writing the letters of words. It is based upon the principle of fixing the orthographical structure of words upon the memory through the sense of sight It assumes that the word is presented to the mind as a picture, in which the elements are distinctly perceived and remembered in their order.

There are many advantages of the Written Method as compared with the Oral Method. First, we learn to spell more readily by sight than by sound. That which we see makes a deeper impression on the mind than that which we hear. The old adage that "Seeing is believing," expresses this fact. In proof of this principle, it is said that the deaf, who must use the Written Method, learn to spell more readily than the blind. It is also a common experience, that when, in writing a letter, we are in doubt about the orthography of a word, we write it on a piece of paper to see how it looks. Good spellers tell us that in spelling orally they usually picture words in their minds, and name the letters accordingly.

A second advantage of the Written Method is, that a pupil taught by this method will spell correctly when he writes, which is the principal point aimed at in the study of orthography. Experience has shown that a pupil may be skilled in oral spelling, and make many mistakes in orthography in his letters and compositions.

A third advantage is that by the Written Method the pupil will spell all the words in the lesson, while by the Oral Method he spells only part of the words. The Written Method thus gives a more thorough drill in orthography during the recitation than the Oral Method. It also affords a better test of the comparative skill of the members of the class, since all spell the same words.

A fourth advantage is that it gives the pupil an opportunity to review the misspelled words. This is one of the most important points of a lesson in orthography. In any ordinary spelling-lesson, the pupil can spell one-half of the words before looking at them ; it is the hard words which he is liable to miss, that it is most important for him to study. If he misses these words and is not drilled upon them till he can spell them correctly, he receives no advantage from the lesson By the

Oral Method, the teacher cannot tell what words each member of the class is unable to spell; and it would be very inconvenient for him to keep a list of the words that are missed in order that they may be reviewed by the pupil.

Another advantage is that it keeps all the pupils employed during the recitation and holds the attention of all. A portion of the class cannot be inattentive while the others are spelling, as is often the case in the Oral Method. It should also be remarked that the pupil who learns to spell by the Oral Method of recitation is actually learning orthography by seeing the words as he studies them, and that he depends in spelling on his memory of the form of the word, rather than upon the recollection of the order of the names of the letters.

Having considered the character of the two methods of teaching orthography, we will now describe the manner of conducting recitations according to each.

III. Written Method of Teaching Orthography.

A written recitation in orthography may be conducted by using Slates, or the Blackboard, or Blank Books. The methods with Blackboards and Blank Books are now the more generally employed. We shall describe each.

Blackboard Method.—In an exercise upon the Blackboard, the first thing is the preparation of the board. The pupils should erase all the work upon the part of the board to be used, divide it into equal spaces by vertical lines, and each pupil write his name at or near the upper part of the space he is to use. The erasing and spacing may also be done by a committee, if the teacher prefers.

Writing the Words.—The next step is the writing of the words. The words should be written in vertical columns rather than in horizontal lines. Ordinary words should begin with small letters, and proper names with capitals. They should not be followed with any mark of punctuation, as no grammatical relations are to be expressed. Care should be taken that the writing be neat and legible. The *i's* should be dotted and the *t's* crossed, and care taken by the pupil to prevent any doubt as to the manner in which he intended to spell the word. The following couplet, familiar to many of the teachers of our public schools, presents a good practical rule:

> "Dot your *i's* and cross your *t's*,
> Close your *o's* and open your *e's*."

Pupils may sometimes be required to divide words into syllables by means of a hyphen. This will teach them the proper syllabication of words, a knowledge which is often of use to them in writing. A dash should not be used for this division; too great a distance between the syllables destroys the natural appearance of the words. An advantage peculiar to the oral method is thus secured in the written method of orthography. The teacher may also occasionally require them to mark the accented syllables of words.

Instead of each pupil writing the same word, the class may be divided into two sections standing alternately, by counting *one, two, one, two,* etc., the *ones* taking one word, and the *twos* the following word. Or the sections may be formed by numbering *one, two, three, four,* etc., the *odd numbers* writing one word and the *even numbers* writing the next word. There are two advantages in this: first, while one section is writing, the teacher can be pronouncing a word for the following section; second, it removes the temptation of copying a word from a neighbor, as each pupil stands between those who are writing a different list from his own.

Corrections.—After the words are written, the next thing is the correction of the words that have been misspelled. In making the corrections, the teacher spells the words, and the pupils notice whether they have written them correctly, marking the misspelled words. These may be marked by the figures, 1, 2, 3, etc., or by drawing a line under the word, or by placing a cross, ×, after each misspelled word. The latter method is preferred. After the misspelled words have been marked, they should be counted, and the number of them written above or below the columns.

The corrections should be made by the pupils rather than by the teacher. Each pupil may correct his own mistakes; or, at a signal, they may all change places and each pupil correct the work of another. Many teachers prefer the latter method, since it removes the temptation to deceive. I should frequently, however, use the former method, creating a moral sentiment in the class that will protect the pupils from deceit and thus strengthen their moral natures.

Misspelled Words.—The next step is to take a list of the misspelled words. These words should be written in a blank book prepared for this purpose. The pupils should review these words as often as once a week, and there should be a final review of them at the close of the session.

Use of Blank Books.—Blank books, prepared for the purpose, may be used for writing the words instead of the blackboard. The words should be written neatly with pen and ink. The method of writing is the same as that already described in using the blackboard. The corrections may be made by the pupils, but it is preferred that the books be handed to the teacher, and the corrections be made by him. The pupil should then write a list of each day's errors in the latter part of the book. It will be well to begin such a list on the last page of the book, as the pupil cannot know how much room will be required for it.

An advantage of this method is that a permanent record of the spelling exercises is kept. It is also more convenient to keep a record of the misspelled words than by the blackboard method. The method is especially recommended for the advanced classes, and also when the classes are large.

Use of Slates.—In using slates, the pupils write the words on their slates, as in the former methods. Each pupil may then correct his mistakes as the teacher spells the words, or, at a signal, slates may be exchanged, and one pupil correct for another. The misspelled words should be copied in a blank book at the close of the recitation. This method is more convenient for copying the misspelled words than the blackboard method, though it has the disadvantage that the teacher is not able to see the words while the pupils are writing. It is now less used than either of the two previous methods.

Dictation Exercises.—Instead of always writing words abstractly in columns, pupils should often be required to write words as they occur in sentences. Such exercises may be dictated by the teacher, and are called *Dictation Exercises*. The teacher may form sentences containing certain words, and have pupils write as he dictates them; or he may give them one or more words, and have them write sentences containing the words. He may also read sentences and paragraphs from a book or a newspaper, and have them written. Pupils should be required to be careful about the use of capital letters, punctuation and quotation marks, etc. The corrections may be made as before explained.

There are many advantages in dictation exercises. They will teach pupils how to spell words correctly as they use them in writing letters, etc. They will be found more interesting to pupils than writing words abstractly in columns. They will also teach the pupils the meaning of such words as they may not understand, and show how to use them correctly. They will afford pupils a practical exercise in composition, and teach them the correct use of capitals, punctuation marks, etc.

IV. The Oral Method of Teaching Orthography.

The Oral Method of teaching orthography is that which endeavors to fix the correct spelling of a word in the memory by calling the names of the letters. It should be remarked, however, that in reality this oral method is more a form of *recitation* than of *learning* orthography. Even when the pupil recites by this method, he is learning by looking at the words, as he studies his lesson.

In describing the Oral Method of teaching orthography, there are several special points which require our attention. The first is the Position of the Pupil, the second is the Assignment of the Words, the third is the Method of Spelling, and the fourth is Spelling Matches.

Position of Pupils.—The pupils while spelling may be either seated or standing. If seated, they should be as near one another as may be convenient. They should sit erect, with their hands in their laps or on the desk, and their feet on the floor. If standing, they should be in a straight line if possible, their feet in a proper position, their toes on a line, their hands hanging naturally by their side, or folded in front, or, in the case of very young pupils, behind their backs, to keep them out of mischief; the shoulders should be thrown slightly back, and the body erect in a natural and healthful position.

Assignment of Words.—The words may be assigned regularly from head to foot, or to the members miscellaneously The latter is best adapted to secure attention; but the former is necessary if the method of "trapping" is used. The words themselves should be selected miscellaneously, and not in the order of the book, to prevent pupils' calculating and preparing their own words. When a word has been spelled correctly, another word should be assigned; when a word is missed by a pupil, the word is to be passed to the next and continued from one to another until it is spelled correctly.

Another method of assigning words is that in which the teacher does not indicate to the pupils when a word is misspelled, but goes on and assigns the next word as if the previous word had been correctly spelled. Every pupil is required to watch the spelling of each word, and if the previous word has been misspelled, he should spell it correctly rather than the word assigned to him. This is an excellent method to secure the attention of the class.

A method somewhat similar to the preceding is for the teacher frequently to assign the word just spelled, to the next pupil, whether correctly or incorrectly spelled. This keeps each pupil attentive to the spelling of every word, for the teacher's "next" is no indication that the word is misspelled. It keeps a class wide awake, requires each one to spell mentally nearly every word, and gives a certainty of opinion and decision with respect to the orthography of a word.

Another method is to allow the pupils to assign words to each other, beginning after the first with the final letter of the word last spelled. This is an excellent exercise for variety, and awakens a great deal of interest. It also affords pupils an exercise in thinking quickly of words.

In assigning words, the teacher's rule should be, to pronounce the word but once. If a teacher is accustomed to pronounce several times, the pupils will become accustomed to requiring it; if the rule is to pronounce but once, there will seldom be occasion to repronounce a word. I would depart from this rule only when, on account of some noise, or for other reasons, there was a good excuse for a pupil's not understanding the word. When a word is missed, in passing it to the next pupil, it should not be repronounced; each pupil should understand every word assigned. Of course, with very young pupils, a little allowance must be made for circumstances which may distract the attention.

Again, the teacher should not depart from the correct pronunciation of a word to aid a pupil in spelling it. Thus he should not pronounce "sep-*a*-rate," or "ed-*i*-ble," etc., thus indicating the spelling of the word by a mispronunciation of it. This is sometimes done through sympathy, to keep a pupil from missing, but it is nevertheless wrong. If the pupil cannot spell the word without this help, he simply does not know how to spell the word and should fail on it.

Spelling the Words.—When the word is assigned, the pupil's first duty is to pronounce the word. The object of this is to see if the word to be spelled is distinctly understood. The next step is to name the letters of the word in their order, pronouncing the syllables, and pronouncing the entire word at its close. Pupils may also spell by *syllables*, or even by *letters*, that is, each pupil spelling one syllable or naming one letter in a word. This latter method is only for variety, however.

As a rule, I would require pupils to pronounce the syllables of words as they spell them. When so required, they should pronounce the syllable even when it consists of but one letter, as in the word *lin-i-ment*, for often the name of the letter is not its sound in pronouncing the word. I would require also that the previous part of the word be repeated in connection with each new syllable; as, *l-i-n*, *lin*, *i*, *é*, *lini*, *m-e-n-t*, *ment*, liniment. With the more advanced pupils and with long words, it may be sufficient merely to pronounce each syllable as it is spelled, pronouncing the word at its close; thus, *l-i-n*, *lin*, *i*, *é*, *m-e-n-t*, *ment*, liniment. With the most advanced pupils, it will be sufficient, a portion of the time, to have them simply name the letters in their order, indicating the separation of the syllables by pausing between them; as, *l-i-n–i–m-e-n-t*, liniment.

The pupils should speak in a natural tone of voice. Do not allow them to pitch their voices upon a high key, and shout or drawl out the sounds. The "spelling tone," heard in many schools, is very objectionable. Neither should a pupil be allowed to mumble his words. Each element and syllable should be enunciated in a full, natural, and distinct tone of voice.

Pupils should also be required to spell phonetically, that is, by giving the elementary sounds which compose words. Such an exercise belongs more particularly to pronunciation, and comes under the head of *phonic analysis;* but it will be convenient to have it also in the spelling classes.

The Spelling Match.—One of the most interesting and instructive exercises of the oral method is the spelling match. Its competitive principle is a stimulus for preparation; and it carries with it all the excitement of contest and satisfaction of triumph that is felt in a game of base-ball or other contest of skill. We shall describe it somewhat in detail.

The sides are usually chosen by two persons of about equal spelling ability, appointed by the teacher or selected by the class. These "leaders" or "captains" select the members of their sides, by alternate choice until all who are to participate are chosen. There are several methods of conducting the exercise, which we shall attempt to distinguish by characteristic names, and to describe.

Spelling Down.—The usual method is for the opposing parties to stand on opposite sides of the room, words being assigned to each side alternately. When a word is missed on one side, the person missing it takes his seat, and the word is passed to the opposite side, or dropped, etc. The contest is decided by one side being "spelled down;" or by comparing the number left standing at the close of the match.

Saving and Out.—A variation of this method, known among pupils as "saving and out," is that in which, when a word is missed on both sides, the side which at last spells it, saves those of its own number who have missed it from going out. Those on the opposite side, however, who have missed the word, take their seats.

Passing Over.—Another method is that in which when a word is missed on one side and spelled on the other, those who missed it pass to the side which spelled it. A variation of this method is to give the leader of the side a choice of one of the opposite party. This method is objectionable on account of the noise and confusion of passing over, and also for other reasons.

Climbers.—Another method is to send the best speller of each side to the foot of the opposite side, and then assign words from head to foot of each side, the "climber" moving towards head for every missed word that he spells. The side whose climber reaches head first, or at the end of the lesson is the nearest head, wins the victory.

Champions.—Another method is for each side to select champions who step out from their ranks, and like the ancient champions before a battle, engage in a personal contest, the teacher assigning words alternately to them until one of them misses and falls. The side spelled down first, or that has the least number standing at the end of the lesson, loses the battle.

Half-way Line.—Another method is to have the pupils stand consecutively in a single line, each one having an opponent at both sides; then mark a half-way line, assign the words from head to foot, allowing them to trap; and the party which at the end of the exercise has the largest number above the half-way line, wins the victory.

Keeping Tally.—Another method is to have scorers appointed to keep a record of the words missed by both sides, as in a base-ball match, the contest being determined by the tally. All of these methods possess advantages, and may be used to give variety and interest to the exercise.

V. Practical Course in Orthography.

Having explained the two methods of teaching orthography somewhat in detail, we now proceed to present some suggestions for actual instruction in orthography in our schools. This course should be based on the following principles: 1. Teach first by *writing words* rather than by oral spelling. 2. Write words, at first, in *sentences* rather than in columns. 3. Use *familiar words* of which pupils know the meaning. 4. Impress *mental pictures* of words on the memory. 5. Cultivate the *habit of observing* the orthography of words. 6. Call attention to orthography in *all the branches* of study.

Written Spelling.—Young pupils should begin orthography by copying words. They should first copy the sentences as found in their reading books. Their attention should be called to the capital letters and punctuation marks, and they will learn to punctuate and use capitals almost unconsciously. Words may also be given for them to incorporate into sentences of their own construction. With young pupils do not call attention to misspelled words, but erase them and write the words correctly. Older pupils may have words assigned to them to write in columns, as explained under the description of the written method of teaching orthography.

Oral Spelling.—A little oral spelling may be introduced somewhat incidentally during the first two or three years. With older pupils oral spelling may be more frequent. In spelling orally, pupils should be required to form mental pictures of words and then describe them by naming the letters. This picturing of words in the mind will be found to be a most interesting and valuable exercise, and is essential to good spelling. During the second or third year phonetic spelling may be begun; and as the pupil acquires skill in phonic analysis he should be taught to represent the sounds of the letters by the diacritical marks.

The Spelling Book.—With beginners the best spelling book is the school reader. With more advanced pupils the use of a good "spelling book" will be found of great convenience. Such a book contains a list of words that the pupil will use in practical life, many of which may not be found in his reading books. It will also be more convenient for him to study a "spelling lesson" from the speller than from the reader. Care should be taken in using the spelling book that the pupil understands the meaning of the words he spells. This can be secured by requiring him to define them or use them in sentences. Advanced pupils should be encouraged to study the dictionary in order to perfect themselves in spelling.

Pupil's Preparation.—The older pupil should be required to make careful preparation for his spelling lesson. In studying it, he should not depend upon calling the names of the letters and thus trying to fix them in his memory; but he should notice carefully the structure of the words, and endeavor to stamp a picture of each word on his memory. He should always write the words of the lesson, even in preparing for an oral exercise, as he can in this way better fix them in the mind.

Names of Common Things.—The teacher will find it an interesting and profitable exercise to require pupils to spell the names of common things. At the close of a lesson, the teacher may say, To-morrow we will spell the names of all the things found in the parlor, or the kitchen, or on a farm, or in the barn, or in a carpenter's shop, or a blacksmith's shop, etc. The names of flowers, of trees, of articles of dress, of persons, etc., make an interesting and valuable exercise.

Words often Misspelled.—The teacher should select words often misspelled, and drill the pupils upon them. With younger pupils these are the little words; as, *there*, *their*, *which*, *where*, *until*, *some*, *many*, *piece*, *very*, *any*, *pity*, *forty*, *right*, *great*, *every*, *neither*, *weather*, *whether*, etc. These are the words which they use in composition, in writing letters, etc.; and they should be among the very first which the pupils learn to spell. It is a mistake to have pupils spelling words of three or four syllables which they very seldom use, while they cannot spell the little words of every-day life. Drill them also in words of like pronunciation and unlike orthography, a list of which can easily be found or made by the teacher.

In all Branches.—Attention should be given to spelling in all the branches. Frequently require pupils to spell some technical term in arithmetic or grammar, a name in geography or history, etc. We should make orthography specially prominent in the reading-lesson. This will beget in pupils a habit of looking at the structure of words, which will be of great value to them, for it is in this way that literary men and women become skilled in orthography.

Association.—Words whose orthography it is difficult to remember may be associated with other words similarly spelled, whose orthography is remembered. Thus, a gentleman who had a difficulty with *piece*, remembered whether the *i* or *e* came first by associating it with *pie* in the expression, "a piece of pie." A lady who could not remember whether there were one or two *e's* before the *a* in *agreeable*, was told to associate it with the fact that there were two agreeable gentlemen present when she asked the question; and she afterward had no difficulty with the word. A student remembered that there was no *e* before the *m* in *judgment* by the picture of the word on the blackboard with a line drawn by the teacher through the *e* (*judgement*) which the pupil had incorrectly put in it. A little mortification with the misspelling of a word, as many persons have experienced with the word *separate*, will serve to impress the correct spelling. Some artifices like these are of value in those idiosyncrasies by which we are doubtful of special words.

Words to Compose Words.—An interesting exercise in orthography is presented by giving words for the pupils to compose other words out of their letters, using the letters no oftener than they occur in the given word. Thus, the word *treason*, in this way, will give over 100 words; *Baltimore*, over 200; *comfortable*, over 300; *manufactory*, over 500. A prize was offered by the *Christian Union* for the largest number of words formed from *subscription;* the successful competitor made 1049 words. The pupils may also be allowed to use the letters of the word as often as they wish in forming new words. In this way a pupil of our Model School made out of the word *Baltimore* 2184 words.

Rules for Spelling.—English Orthography is so irregular that it acknowledges very little allegiance to rule. Most rules that can be given are subject to so many exceptions that it is usually easier to learn to spell words directly than to remember the rules and their exceptions. No one, therefore, can expect to learn to spell by rule. There are, however, a few rules that admit of very wide application, and are subject to so few exceptions that they may be used with advantage. The most important of these rules relate to the omission or retention of the final letter of a word on receiving a suffix. They may be stated as follows:

1. Final *e* is *omitted* in adding a suffix beginning with a *vowel*, and is *retained* in adding a suffix beginning with a *consonant*.

2. Final *y* when preceded by a *consonant*, is *changed* to *i* in adding a suffix; but when preceded by a *vowel*, it is *not changed* in adding a suffix.

3. A *single final consonant* is *doubled* on adding a suffix,—when the consonant is preceded by a single vowel, and the suffix begins with a vowel, and the final syllable is accented.

4. The *final consonant* is *not doubled*,—if it is not preceded by a single vowel, or if the suffix does not begin with a vowel, or if the word is not accented on the last syllable.

5. Of words ending in *ceous* or *cious*,—those which *relate to matter* end in *ceous*, and all others in *cious*. *Silicious*, sometimes written *siliceous*, is an apparent exception.

False Orthography.—The use of false orthography has been recommended by some authors to aid the pupil in learning to spell. Such exercises are supposed to bear the same relation to learning orthography as false syntax in grammar does to learning to speak and write correctly. The principle is that we learn the right by seeing the wrong; the correct usage by seeing the incorrect usage. It is, however, a question whether such exercises are not a disadvantage. Teachers who have used them say that pupils are liable to confound the correct and incorrect forms, that the picture of the mis-spelled word sometimes clings to the memory and becomes a model to mislead the pupil.

Finally, cultivate an interest among your pupils in spelling, and manifest an interest in it yourself. Make them feel that poor spelling is a disgrace; and lead them to see that correct spelling is a characteristic of a cultivated lady and gentleman Train them to the habit of noticing the orthography of words in their reading, for it is in this way that men and women really learn to spell.

CHAPTER VI.

TEACHING READING OR ELOCUTION.

READING, or Elocution, is the art of giving proper oral expression to thought and sentiment. It is the art of correct vocal delivery with the speaking tones of the voice in distinction from the singing tones. Reading and Elocution are very nearly synonymous, though the latter term is generally applied to the higher departments of Reading. Silent Reading, or reading to one's self, is not included in the definition, as this is merely seeing the thought through the words, and not oral delivery.

Importance.—Reading is one of the most important branches in our schools. This importance may be somewhat appreciated by comparing it with other branches, as arithmetic, grammar, music, etc. Many persons would rather be a great elocutionist than a great mathematician, grammarian, or musician. The great actors have been as highly honored as the great musicians; Charlotte Cushman has perhaps as enduring a fame as Jenny Lind. The eminent orators stand as high in public appreciation as the eminent mathematicians; though part of this eminence is due to the thought and sentiment expressed, rather than to the delivery. Reading is a fine art, and should be regarded as a valuable accomplishment; with proper attention to it, we could make reading and reciting as popular in society as playing the piano or singing.

Reading has been very poorly taught in most of our schools. In the colleges, until quite recently, no instruction whatever was given in delivery. In our seminaries and academics, though there were special teachers of mathematics, natural sciences, languages, etc., any one was regarded as competent to hear the reading classes. The pupils in our public schools were "taught to read," but it was really a "calling of words" and not reading in its true sense. The best work in this branch has been done in our Normal Schools, and their influence in improving the methods of teaching reading has been wide-spread and beneficial.

We should make a special study of reading, and endeavor to excel as teachers of it. Even for the teacher's own culture and success, it will be found of great advantage. Our influence will depend almost as much upon the manner of our saying things, as on what we say. In social life, we render ourselves agreeable and increase our influence by an attractive and pleasing manner of expression. Business success depends largely on a person's address; and influence in public life is to a large extent the result of a clear and forcible expression of thought. A public speaker should be a good elocutionist. The great orators were skilled in their delivery, as well as clear and forcible in their style of composition. It is reported of Whitefield that he could move an audience to laughter or tears by the utterance of the word *Mesopotamia.* Demosthenes and Cicero cultivated the art of delivery with the most assiduous care, and were masters of expression as well as of composition.

Methods of Teaching.—Methods of teaching reading may be discussed under three heads; the *Mental Element*, the *Vocal Element*, and the *Physical Element.*

The *Mental Element* is that by which we understand and feel what we read. It includes the Intellectual and the Emotional elements. The Intellectual Element is that by which we understand what we read. The Emotional Element is that by which we feel and appreciate what we read. Both of these are necessary conditions for correct and effective reading.

The *Vocal Element* is that which pertains to the voice. It embraces Pronunciation and Modulation. Pronunciation is the art of giving correct utterance to individual words. It embraces Articulation and Accent, both of which have been discussed. Modulation has reference to the variations of the voice in reading and speaking. It embraces Quantity, Compass, Quality, and Time, each of which has its appropriate subdivisions.

The *Physical Element* is that which pertains to the body and its members. It includes Breathing, Posture, Gesture, and Facial Expression.

Principles of Teaching.—There are several fundamental principles that will be of advantage to teachers of reading. The most important of these are Natural Expression, Imitation, Principles, and Correcting Errors.

1. *Natural Expression.*—The fundamental principle in teaching reading is that of *natural expression.* The constant effort of the teacher should be to have the pupils *read naturally*, or *to read as they talk.* The following ideas should be kept constantly before the pupils' minds.

Talking is the *natural expression* of *one's own thoughts; reading* is the *natural expression* of *written* or *printed thought.* Written or printed thought should be expressed in the same way as one would express it if it were his own thought.

Good conversation is thus the basis of good reading. Good reading is reading as one talks. To read well a person should express himself just as he does in natural conversation. If his conversational style is faulty, the first step is to correct and improve it.

To read naturally, the pupil must *make the thought of the author his own thought*, and then express it just as he would if he had originated it. The reader must *re-create the ideas of the author* and stamp them with *his own personality*, and then express them *as if they were his own* and not another's.

2. *Imitation.*—Reading is an art, and like other arts must be taught partly by *imitation.* We learn to talk by imitating our parents and other members of the household; and we learn to write by imitating written or printed forms. So in order to

learn to read well, we must hear good reading. The teacher, therefore, should read for his pupils and have them imitate his reading, being careful to avoid all mannerisms that may vitiate their style or interfere with natural expression.

The *teacher should be a good reader*, that he may present a correct model for his pupils. He must often lead them to correct expression by having them imitate his own reading of a sentence or selection. This is the more necessary from the fact that there are many things in the reading book so different from the ordinary topics of conversation that pupils need the model of the teacher's voice and manner to guide them.

3. *Principles.*—There should also be *some general principles* to guide a pupil in reading. By a principle of reading is meant some *general law* which can be readily applied to the particular forms of discourse we meet with in literature. Rules of reading have been criticised, and properly so, for no one can learn to read correctly by rule. A principle, however, is more flexible than a rule, and will be found of very great value, with the more advanced pupils, in learning to read.

4. *Correcting Errors.*—The teacher must also rely on the *correction of errors* for instruction in the art of reading. He must notice carefully the *errors* of pupils, and *correct* them. He should not merely call attention to these mistakes, but should train the pupils in correcting them until they have overcome the old habit and acquired the new one. It is sometimes well to *imitate the mistake* of the pupil; his attention being thus called to it, he will usually correct it himself.

Teaching Primary Reading.

The course in Primary Reading includes such instruction in the art of reading as is required by the majority of the children in our public schools. Suggestions for this course will be presented under the three general divisions named.

I. The Mental Element.—The Mental Element lies at the basis of good reading. The mind thinks the thought, and in correct reading the voice should express just what is in the mind. The pupil should, therefore, understand that *good reading is merely having something in his mind and telling it.*

All the principles of reading have their origin in the mind, and are applied by it. The most important of these principles, which may be regarded as the conditions of good reading, are those of Comprehension, Appreciation, and Conception.

1. *Comprehension.*—The first law of good reading is *that of comprehension.* The pupil must be led to see that *reading is not calling words in the book,* but merely *telling what he thinks and feels.* He must be taught to *read from his thought* and *not from his book.* In order to do this he must be trained to the habit of *getting the thought* of the selection he is reading.

1. See that the pupil understands the *meaning of the words.* Go over the sentences and paragraphs and call attention to such words as the pupil may not understand. Have the pupil *use the words in sentences,* to see that they are understood.

2. See also that the pupils understand the *thought expressed* in the sentences. Have them *state the thought in their own words.* Require them to look at a sentence and *grasp it as a whole* before attempting to give it expression.

3. Require pupils to *analyze each sentence* and *paragraph,* and point out the *prominent ideas,* so that they may know where to place the *emphasis.* When they do not see the prominent ideas call attention to these ideas by appropriate questions.

4. Require pupils to *study their reading lessons. Examine* them on the lesson to see that they understand it before permitting them to read. Explain such things as are not understood, especially figures of Rhetoric, such as similes, metaphors, personifications, historical and classical allusions, etc.

5. Do not go through the book *too rapidly.* In teaching reading it is a good maxim to "make haste slowly." Keep pupils at a selection until they are quite familiar with it. The better they know it the better they can read it. Let the first aim be to *make the pupils thoroughly comprehend* what they are reading.

2. *Appreciation.*—The second law of good reading is that of *appreciation.* Pupils should be led to appreciate the sentiment of what they read. The voice should manifest the feeling as well as the thought; the heart should speak in the voice as well as the head. Reading without feeling in it is a cold mechanical thing without beauty or power.

1. To awaken an appreciation, see that there is a full and complete comprehension of the subject read. What is not understood cannot be very well appreciated; a clear idea in the mind naturally awakens some corresponding feeling in the heart.

2. Try to make the appreciation so full as to result in a *complete assimilation* of the thought or sentiment. Lead the pupil to make the thought or sentiment *his own,* as if it were the product of his own mind and heart; and he will then read it as if he were telling *something he had thought or felt.*

3. To secure this condition of appreciation and assimilation usually requires careful culture. It is a matter of taste, and the culture of taste is often a slow process. Try to lead the pupil to see what is beautiful and admirable in thought and sentiment; to have his heart throb responsive to the beautiful image or touch of pathos expressed in the author's lines.

4. Do not allow pupils to read subjects that are not suited to their appreciation. Such sentiments as "Contentment," "Patriotism," "Melancholy," "Aristocracy," etc., are foreign to the heart of a child, and such subjects should not be given him to read. He can appreciate "the pleasures of coasting," "sorrow at the loss of a pet bird," etc., and his voice will throb in unison with his beating heart as he reads of these things.

3. *Conception.*—Pupils when reading should form a clear and vivid conception of the subject. Young children describe what they have seen with graphic effect, because the *picture of what they* are describing stands before their mind as they are talking. Lead them to picture, in the same way, what they read, and they will also express it vividly and naturally.

1. Require pupils to form *mental pictures* of such things as can

be represented by the Imagination. If they read, "I see a bird in a tree," they should form in the mind a picture of *the tree* and *the bird in it.* If they read of "a boy fishing," they should see the water, and the boy in the act of catching fish. If the lesson is about "a horse running away," require them to picture the horse running just as they would if they had seen it and were describing an actual run-a-way.

2. With the more advanced pupils, take such selections as "A Leap for Life," by Colton, or "The Day is Done," by Longfellow, or "Abou Ben Adhem," by Leigh Hunt; and require the pupils to form pictures in the mind as they read or recite these selections. Test the power to picture by asking them to describe what is in the mind when they read.

3. Where a mental picture of the subject can not be formed, try to make the abstract conception as clear and real as possible. See that the thought or sentiment is distinctly conceived. When the conception is distinct and real, the heart will respond to the thought, and the voice will instinctively and truthfully portray the sentiment.

4. This exercise of vivid conception will be found of great value in teaching reading. It gives a reality to the subject in the pupils' minds which makes their reading not a mere *calling of words*, but a real *relation of the thought or incident* expressed by the author. It may be stated as a maxim that *vividness of conception is a golden key to truthful and effective expression.*

II. The Vocal Element.—The next step is to attain a proper use of the voice in delivery. First, there should be *exercises* to train the voice in the correct utterance of sounds. Second, care should be taken that all the words be correctly *pronounced.* Third, the form of *expression* of words in sentences should be correct and pleasing. These three points will be considered under the heads of Exercises, Pronunciation, and Expression.

1. *Exercises.*—Pupils require some exercises to give flexibility and precision to the voice. These exercises train the ear to a delicacy of perception that will enable the pupil to correct his

errors and improve his utterance. They will also give such a control over the voice that it can be readily adapted to the different selections read. The following exercises are suggested.

1. Train the voice in respect to *force, pitch*, and *rate.* Use the vowel sounds (*vocals*) ā, ä, ă, á, ē, é, etc., for this purpose. Unite these *vocals* with the *consonant* sounds (*sub-vocals*), as *bā*, *bä*, *bă*, etc. Drill also on special words; as *arm*, *gold*, etc.

2. For exercises in Force, require the pupils to repeat the sounds with varying force, from *soft* to *loud.* Have similar exercises on *words* and on *sentences* appropriately selected.

3. For exercises in Pitch, have the pupils repeat the *vocals* on different degrees of the musical scale from *low* to *high.* Have them sing the musical scale, and use it in exercises on pitch. Drill on *slides* or *inflections*, both *rising* and *falling.*

4. For a drill in Time, use the *vocals* and *words*, repeating them with *shorter* and *longer* time. Have them also read *sentences* with *different degrees* of time. Drill also on *pauses.*

5. For a drill in Emphasis, use properly selected sentences containing emphatic words. Sentences containing contrasted emphasis will be of special use in this exercise. Lead them to see that the prominence of the idea determines the emphasis.

2. *Pronunciation.*—The pupil should be able to pronounce readily and correctly all the words in the reading lesson *before he begins to read.* Bad reading and bad habits in reading often result from the pupils stumbling over unfamiliar words.

1. See that pupils are able to *pronounce words at sight.* Require them to know the words at a glance, so that they can speak them in reading without hesitation or stammering.

2. It is often well to go over the sentence or paragraph and have the pupils pronounce the words before they attempt to read it. They may sometimes begin at the latter part of the paragraph and "pronounce the words backward."

3. With the more advanced classes, before reading a new lesson, go over it and have the pupils *pronounce the unfamiliar* or *difficult* words. Some of these may be written on the blackboard to aid the pupil in remembering them.

4. Careful attention should be given to articulation and accent. Let the teacher be particular to secure clear and distinct enunciation. Do not permit a drawling tone in the utterance of words, nor a slovenly, careless or unrefined pronunciation.

3. *Expression.*—The proper use of the voice in vocal utterance is the final step in reading. This is a high accomplishment, and demands great care for its attainment. What has been previously explained is all preparatory to this final object, but a few special suggestions on expression will be of value to the teacher.

1. The fundamental principle of expression is that the voice exactly *express the thought which is in the mind.* To secure this, see that there is *comprehension, appreciation* and *conception;* and then that the *force, pitch* and *rate* are such as the sentiment requires.

2. See that the pupils read *naturally*, as *they would talk*, provided they talk correctly. Let the *natural expression* of the pupil be the basis of his method of reading. If he does not read naturally, require him to look off his book and *tell you* the subject.

3. Be careful to secure a *proper variety* in the tone of the voice, as in good natural conversation. Do not allow children to use the stilted and mechanical tone so common in our schools, nor the monotonous sing-song in which young persons often read. Discard by all means the well known "school-room tone."

4. See that the *emphasis* is properly placed, as misplaced emphasis is one of the common faults of reading. Be sure that the pupil fully understands the subject he is reading, and sees which are the important ideas. Lead the pupil to see what ideas are most important, and he will give correct emphasis.

5. Notice with care that the *pauses* be properly placed, and are of the proper length. Lead the pupils to see that it is the thought, and not the marks of punctuation, that determines the place and length of the pauses. Show them also the value of the pause *after* and *before* the emphatic word.

6. See also that the *slides* or *inflections* are properly used. Lead pupils to see that the sense will determine whether the slide

is *downward* or *upward*. Call attention, when they are in doubt about the slide, to the manner in which they would naturally express themselves if they were telling the subject. Do not allow the use of the *circumflex* where it is not required by the sense.

7. See also that there is proper *natural melody* in the use of the voice. Be careful that there is no jerkiness or abruptness in the use of the voice; but a natural melodious flow of tone that gives a sense of musical beauty to their expression.

III. The Physical Element.—The Physical Element in reading is that which pertains to the body. It is of special value in recitation and oratory, but needs little attention in ordinary reading. Only a few suggestions will therefore be presented under this head.

1. Have pupils stand erect, with the book in the left hand, so that the right hand may be free to turn the leaf when needed. While reading the right hand should hang at the side.

2. See that the feet are in a natural, easy position, and that the body is erect with the shoulders thrown gently back to give freedom to the organs of the chest.

3. Permit no lounging or leaning upon the desk or against the wall, or standing in any awkward or ungraceful attitude.

Finally, teachers, if you see that your pupils *stand* in a *proper attitude;* that they *comprehend, appreciate* and *conceive* what they read; that they read *naturally,* with correctness of *force, rate, pitch, emphasis, slides, pauses,* and *melody;* you will be a successful teacher of reading in our public schools.

II. Teaching Advanced Reading.

The course in Advanced Reading shows the principles upon which the art is based, and aims to inculcate the practice from the theory. It embraces a brief treatise upon Elocution, and prepares for recitation and declamation as well as reading. It is presented under the three elements already named; viz.:

I. The Mental Element. II. The Vocal Element.
III. The Physical Element.

I. The Mental Element in Reading.

The Mental Element in reading is that by which we understand and feel what we read. It includes the Intellectual and Emotional elements. The Intellectual Element is that by which we understand what we read; the Emotional Element is that by which we feel what we read. Both of these will be briefly considered.

The Intellectual Element.—A pupil should understand what he reads. No one can read correctly what he does not fully comprehend. He may pronounce the words correctly, but unless he comprehends the thought he is endeavoring to present, it will be merely "calling words," not reading. This condition of good reading is frequently neglected. Pupils are allowed to read without having any idea of the meaning of what they are reading. Pupils sometimes speak pieces without any clear conception of the ideas and sentiments expressed. The artificial and unnatural style in which young persons read is largely due to the neglect of this principle. Most ridiculous mistakes are sometimes made by pupils in endeavoring to read that which they do not understand, or which they misunderstand.

Pupils should be required to prepare their reading lessons as they do other lessons. Every pupil should *study* his reading lesson. He should see that he knows the meaning of the words, the idea intended to be expressed by the author, the general character of the sentiment, the meaning and force of the prominent allusions, rhetorical figures, etc. It will be well to go over the lesson and mark the emphasis, slides, varieties of voice, etc., appropriate to the different parts of the piece to be read. If a portion of it were entirely or partly committed to memory, it could be read much more readily and correctly. It is said that the great orators studied their addresses so carefully that they knew just what words they were to emphasize, where to make a gesture, etc.

Teachers should examine their pupils to see that they understand the reading-lesson. They should ask them questions upon the meaning of words, upon the thought intended to be presented, upon the figures and allusions that may be used, upon the historical or biographical references, upon the general sentiment of the piece, and upon the style or character of the composition. Teachers who have not been accustomed to such an examination will be utterly surprised at the ignorance and thoughtlessness of pupils in this respect. Some very amusing and ridiculous mistakes could be given, illustrating the necessity of such questions. Pupils may often be required to give the sense of a passage or paragraph in their own language, to see if they understand it. Be especially careful in their reading of poetry, that it is not a sing-song of words, without any true conception of the meaning.

The teacher should explain what the pupil does not understand. He should explain the meaning of words, sentences, allusions, figures of rhetoric, etc., which the pupil has not understood. When the pupil meets such expressions as the "Archimedean lever," or the "Palladium of our liberties," as found in Washington's address, or the "Niobe of nations," as found in *Childe Harold*, etc., the teacher should explain the historical fact or mythological story from which they are derived, and show the force and beauty of the figure. So in reading poetry; when he comes to such passages as "The darkness falls from the wings of night," or "And Wind, that grand old harper, smote his thunder harp of pines," or "The Morn in russet mantle clad, walks o'er the dew of yon high eastern hill," etc., let the teacher call the attention of the pupil to the beauty of the image and make his imagination picture it before the mind as it was seen by the poet who wrote it. The heart of the learner can in this way be thrilled with the emotion of beauty, the imagination be trained, and the literary taste be cultivated

The reading books should be adapted to the pupils. For young pupils, we need simple descriptions, lively narratives, and interesting conversations or dialogues; for more advanced pupils, essays, reflections, discussions, orations, etc., are appropriate. This principle is frequently disregarded. Many authors have completely failed in the adaptation of the reading matter of their books to the capacity and taste of the pupil. Only a few seem to have accomplished the difficult task of entering into the sphere of child-life, and adapting their writings to children.

Teachers must also be careful to grade the books properly for the pupils. The general fault is that the books are too difficult for the classes using them. The pupil is often in the Fourth Reader when he should be in the Second or Third Reader. In such cases the pupil should be put in a lower book if possible. If this cannot be done, the easier pieces should be selected, and the pupil drilled on them until he is familiar with all their difficulties. The more familiar a pupil is with a piece the better he can read it.

The reading teacher should be a good scholar. In no class does a teacher require so much general culture as in reading. He needs a knowledge of history, mythology, rhetoric, etc., in order to explain the references, allusions, rhetorical constructions, etc., in the lesson. The reading class, properly taught, can be made the most interesting and profitable class in the school. More can be done for literary culture here than in any other study. Indeed, many a person has received his first impulse to literary culture in the reading class as taught by some earnest and enthusiastic lover of literature.

The Emotional Element.—A pupil should not only understand what he reads, but he should also feel and appreciate it. Literature appeals to the heart as well as to the head. The reader should be susceptible to all the various phases of sentiment, and feel them when he is reading so that he may make others feel them. If the subject is pathetic, his heart should be touched with pity; if it is humorous, he should appreciate the humor; if it is grand and sublime, he should feel the emotion of grandeur stirring in his soul. This point is of great importance in all the higher departments of reading, and demands the teacher's attention.

Pupils do not usually feel or appreciate what they read. They will read one style of composition in just about the same tone and pitch as another, so that if you judged the composition by the manner of reading, you could not tell whether they were reading a funeral sermon of Bossuet, or a humorous description by Mark Twain. There is no response to the touch of pathos or beauty, no heart-throb to the poet's line, or the orator's sentiment; indeed there is often no more feeling than if a talking machine were repeating the words of the reading-book.

The teacher should call the attention of the pupils to the sentiment, and endeavor to awaken an appreciation of it. By appropriate questions and explanations, he should endeavor to open the eyes of the pupil that he may see, and unseal his heart that he may feel, those touches of beauty and humor and pathos which throb in the poet's line, or live in the orator's phrase. He should give illustrations of the different kinds of sentiments, and show how the voice and manner should be adapted to express them. In a word, he should train his pupils so that they may feel what they read, as well as understand it.

Reading books should be adapted in sentiment to the age of the pupils. The grander sentiments of sublimity, patriotism, etc., are not suitable to children. They cannot be expected to be much moved by a description of the "Sublimity of the Starry Universe," or the "Enjoyments of Contentment," or the "Remorse for Neglected Opportunities." The pathetic and many forms of the humorous, however, will be readily appreciated. The narration of interesting events, of dangers in field or forest, of hairbreadth escapes, of the robbing of a bird's nest, of sorrow at the loss of a mother or sister, etc., will awaken their little hearts to intense feeling. The compilers of text-books on reading should bear this in mind, and govern themselves in their work accordingly.

The teacher should not only be a good literary scholar, but he should also possess a cultivated taste. Refinement of mind, a heart to feel and appreciate the beautiful and good, will enable a teacher of reading to touch the hearts of his pupils and cultivate in them a refinement of taste which will improve both their character and their reading. The teacher of reading should therefore take special pains, by the study of the fine arts and the cultivation of that which is beautiful and noble in human character, to acquire such refinement of taste and feeling as shall fit him for the highest attainments in his high art.

II. The Vocal Element in Reading.

The Vocal Element in reading is that which pertains to the voice. It is the fundamental element of the art of reading. The Mental Element is merely a condition for good reading, and the Physical Element an accompaniment of it; but the Vocal Element is that which is immediately concerned in reading. It is the basis upon which the art is established.

The importance of vocal culture in reading cannot be overvalued. The excellence of reading depends mainly upon the character of the voice. When the voice is harsh or hard and inflexible, it is impossible to read with artistic effect. A full, rich, musical voice will chain the attention of an audience, independently of the sentiment expressed; and when employed in the expression of noble and soul-stirring sentiments, its influence is irresistible.

Much of this excellence can be acquired by judicious culture. Though some voices are by nature richer and more musical than others, yet careful training will remove many defects and impart flexibility and sweetness in a remarkable degree. Nearly every one is familiar with what culture and training will do for a singer; and vocal culture is as necessary and useful to the reader as to the singer. The human voice, in the hands of a master, will attain to a wondrous strength and richness of tone. Practice also will give a person such a command over his voice and enable him to use it with such skill, that he can hold the attention of an audience by the music of his utterance, and thus deepen the impression of the sentiments he may express.

The Vocal Element embraces four things; *Quantity*, *Compass*, *Quality*, and *Time*. These elements are usually included under the head of Modulation. Each of them will be considered somewhat in detail.

I. Quantity.—Quantity, as employed in reading, has reference to the amount or volume of the voice. It is used by some elocutionists to mean the time occupied in pronouncing a word or syllable; but this is not the best or most acceptable use of the term. Quantity in reading is a general term including *Force*, *Emphasis*, *Stress*, and *Slur*.

Quantity of voice is an important element of expression. Each sentiment has its appropriate quantity, and the quantity, if properly used, will indicate the sentiment. Thus, joy is expressed in a full tone, sorrow in a subdued tone; modesty, humility, shame, doubt, mystery, etc., require soft and subdued tones. Anger declares itself in loud tones, confidence asserts itself with a full voice, secrecy softens the tone and speaks with muffled voice or whispered accents.

Force.—Force is the quantity of voice used in reading or speaking. It is quantity as applied to vocal delivery. As used here it has reference to the *standard force* of the voice in reading or speaking.

There are three degrees of Force; *Soft*, *Moderate*, and *Loud*. Moderate Force is the ordinary force of the voice in reading and speaking. Soft Force is less force than the ordinary quantity; and Loud Force is more force than the ordinary quantity. These are not fixed degrees of force, but merely relative distinctions. Let the pupil be careful not to confound *loud* and *soft* with *high* and *low*, which are degrees of pitch. A mistake of this kind often leads the reader, when he designs to increase his force, to raise his voice to a higher pitch, thus giving a higher instead of a louder sound.

How Teach.—We should teach reading with respect to force by Exercises, Imitation, and Correcting Errors.

Exercises.—The Exercises recommended to cultivate force are as follows: 1. A frequent drill on the elementary sounds; 2. A drill on sentences selected for the purpose; 3. Physical exercises to develop the general health and strength.

In the drill on the elementary sounds, we should begin with a moderate degree of force, and then increase the force gradually to the limit of loudness, being careful not to strain or overtax the voice. Having reached the louder tones, pass gradually from these to the softer tones. After some practice in this way, the pupil may begin at the loud tones and pass to the softer ones; or he may practice striking at once different degrees of force until he can give with ease and precision any degree of force, from whispering to shouting.

Similar practice with well-selected sentences is also valuable. Let the same sentence be given with varied degrees of power; and let sentences be selected requiring variety of force for their natural expression. Such exercises, continued for a few months, will greatly enlarge the quantity of the voice and give the reader a command over it by which he can readily adapt it to the requisites of reading or speaking.

In case of weakness of voice, arising from ill health or lack of physical strength, a course of gymnastics is recommended. The weak voices with which many clergymen are troubled, could be cured on the base ball ground or in the gymnasium Theological students, or those preparing for public speaking, should take special pains to secure a vigorous constitution. Many a sermon could be rendered more eloquent and effective in this way, and many a case of bronchitis avoided.

Principle.—Determine the standard force by the general spirit of the piece. If the general spirit is unemotional, the standard force is moderate; if the general spirit is bold, noble, dignified, etc., the standard force is loud; if the general spirit is grave, subdued, pathetic, etc., the standard force is soft. The pupil who grasps this principle and applies it intelligently, will find it of great value in reading.

Correct Errors.—Some pupils read too softly or with too little force. This is often the case with young ladies. The admiration of the "low voice in woman" is carried to such an extent with many, that it is regarded as unladylike to read in public so as to be understood. It is an error, however, and one that should be corrected.

To correct the error of reading too softly, the teacher must notice its cause. Reading too softly is sometimes the result of a weak voice, sometimes of timidity, sometimes it is merely an affectation, and sometimes an unconscious habit. Correct the first by strengthening the voice, the second by aiding the pupil to acquire confidence, the third by a little judicious ridicule, and the fourth by showing the pupil the defect and inducing him to overcome it. A pupil who reads too softly may be placed at a distance from the teacher in reading. Such pupils may read dialogues, standing on opposite sides of the school-room, or at some convenient distance from each other.

Some pupils read too loud. Boys often make this mistake. Loud reading was formerly considered the best reading; and boys would read almost as loud as they could shout. We can correct this error by showing them how unnatural and inappropriate it is, and thus lead them to a natural method of expression.

Most pupils do not adapt the force to the sentiment. This arises from the fact that they do not understand that to read anything is to express it naturally. This error needs the teacher's most careful attention. The pupil must be led to see that reading is natural oral expression, and that the force of the voice must be adapted to the sentiment expressed.

EMPHASIS.—Emphasis is particular force applied to one or more words of a sentence. Its object is to give prominence and distinction to the important ideas. It brings out the meaning of an author, makes his thoughts and sentiments impressive, and gives beauty to expression as the play of light and shade does to a picture. A true emphasis keeps the attention of the listener in active sympathy with the thoughts of the speaker, gives full effect to all he utters, and makes a leep and lasting impression on the memory.

There are two kinds of emphasis; *Absolute* and *Antithetic.* Absolute Emphasis is that which is applied to the prominent ideas of a sentence without any particular comparison with other ideas. Antithetic Emphasis is that which is used in contrasting ideas; as, "I said an elder soldier, not a better."

How Teach.—We teach Emphasis by means of Exercises, Imitation, Principle, and Correcting Errors.

Exercises, etc.—For Exercises, drill the pupils on well selected sentences containing emphatic words. Dialogues will be found most suitable for young pupils. Repeating the elementary sounds, emphasizing at intervals, is a good drill exercise. The teacher should also read for the pupils, placing the emphasis correctly, and require the pupils to imitate him. Some of the chapters in the Bible, as that of the Prodigal Son, so often incorrectly read, might be selected as an example.

Principle.—No specific rule can be given for emphasis; it is a matter of judgment and taste. The principle of Prof. Bailey will be of great advantage in applying emphasis. This principle is closely related to that of Force, and, as he gives it, is a part of the former. It is as follows: Having determined the standard force for the unemphatic ideas, give more force to the emphatic ideas according to their relative importance.

Correct Errors.—The teacher should constantly watch and correct the errors of pupils with respect to emphasis. The most common errors are those of incorrect and random emphasis. Sometimes the emphasis is wrong because the pupil mistakes the sense; this is corrected by calling attention to the important word. More frequently, the emphasis is applied at random, without any thought as to the prominent ideas. This error is often heard in the reading of the Bible and sacred hymns. It may be corrected by calling attention to the proper use of emphasis, and the reader's disregard of it.

A very common fault in emphasis is the use of the circumflex upon the emphatic word instead of the slide, as will be subsequently explained. The faulty emphasis of the circumflex can be removed by drill on appropriate examples, and by expedients adapted to individual cases. Another fault, often met with, is that of stiff and excessive emphasis, which can be removed by practice, the study of good models, and the culture of taste.

Stress.—Stress is force applied to particular parts of monosyllabic words or syllables. It is an unequal distribution of force on a syllable, and gives variety in the expression of a single word, as emphasis does in the expression of a sentence. There are five kinds of stress; *Radical*, *Vanishing*, *Median*, *Compound*, and *Thorough*.

Radical Stress is force applied to the first part of a monosyllabic word or of a syllable. It may be illustrated by pronouncing the words *eat*, *out*, etc. It is used in expressing anger, command, positive assertion, and in energetic sentiments of all kinds. By it animals are awed into submission, and audiences are often startled, thrilled, and swayed.

Median Stress is force applied to the middle of the word or syllable; as may be heard in pronouncing *gold*, *far*, *leap*, etc. It is used in expressing dignity, grandeur, solemnity, supplication, plaintiveness, etc. Median Stress gives beauty and expression to delivery. It is the natural utterance of thoughtful sentiment, and the swell is more or less prolonged as the feeling is moderate, or deep and full, lofty and sublime

It gives music to poetry, the spirit of devotion to sacred composition, and the touch of eloquence to oratory.

Vanishing Stress is force applied to the latter part of a word or syllable; as may be illustrated in pronouncing *bell*, *low*, *ring*, etc. It is the expression of intense feeling deferred and accumulated upon the latter part of a word, as a child says, *I won't*, *I shan't*. This stress is used in expressing earnest purpose, determination, stern rebuke, contempt, astonishment, horror, etc. It is not so much an element of dignity as the median stress, yet it is an essential condition of high-wrought feeling and impassioned utterance. Without vanishing stress, oratory would often lose its manly energy of determined will, and high-wrought resolution would fail of expression; while for the natural utterance of the elevated emotion and extreme passion of lyric and dramatic poetry, it is indispensable.

Compound Stress is a combination of the radical and vanishing stress. It is force applied on the first and last part of a word, as may be illustrated in the sarcastic utterance of the word *yes*. Compound Stress is used in expressing surprise, sarcasm, in Irish brogue, in snappish sentiments, etc. It is not an agreeable form of stress, and should be used only on those rare occasions which especially demand it.

Thorough Stress is stress running through the entire word or syllable. It is used in expressing command, denunciation, bravado, and in exaggerated and mock heroic sentiment. When applied to continuous speech, it destroys the grace and delicacy of utterance and becomes a sign of rudeness and vulgarity. Judiciously employed, it is often a powerful weapon of oratory; but when indiscriminately used it becomes mere ranting, and excites feelings of ridicule and disgust.

How Teach.—Pupils should be drilled first on individual words until they can give them with the required stress, and then upon appropriate pieces requiring different degrees of stress. Repeating the elementary sounds with varied stress affords an excellent exercise. The teacher should also present proper examples of stress for the pupils to imitate. In order to establish a principle, Bailey includes all varieties of stress under two heads,—Smooth and Abrupt. His principle is as follows: All pure and beautiful ideas should have smooth stress; all abrupt ideas should have abrupt stress. The natural language of stress which we have given in discussing each kind of stress will be a better guide in its use, however, than this principle.

SLUR.—Slur is a smooth, subdued, gliding movement of the voice applied to the less important parts of a discourse. It is generally used in what are called parenthetic passages.

We teach slur by drilling the pupil in suitable exercises, by presenting good models for his imitation, and by correcting his errors. No principle can be given which will be of much advantage to the learner.

II. Compass.—Compass has reference to the highness or lowness of the voice in reading or speaking. In speaking or singing, the voice moves between certain limits, above or below which it cannot utter sounds. The range included between these limits is known as the compass of the voice.

In singing, the voice moves gradually up or down a series of eight sounds called the *Scale*. The distance between any two points in the scale is called an *Interval*. The distance between any two successive sounds of the scale is called a *second;* the distance between the 3d and 4th and 7th and 8th, being half as large as the other intervals, are called *minor seconds*, while the others are called *major seconds*. The distance from one to three of the scale is called a *third*, from one to four a *fourth*, etc., and from one to eight an *octave*. A *third* which consists of two *major seconds*, is called a *major third;* a third of one *major* and one *minor second*, is called a *minor third*.

The voice may pass directly from one note of the scale to another, as in singing; or it may *slide* from one degree to another, as in speaking. The former is called a *discrete* interval; the latter a *concrete* interval. In tne concrete interval, the voice rises concretely through the different intervals, as in sliding the finger on a violin string. The *discrete* interval *steps*, as it were, from one tone to another, like the tones of the organ. The former, figuratively speaking, is a rising or falling stream of voice; the latter is a voiceless space.

The first sound of the scale is called the *Key-note*. The pitch on which a syllable or word begins, is called its *Radical Pitch;* the point at which the voice arrives by a concrete or discrete movement, is called its *Concrete* or *Discrete* Pitch, etc. The subject of Compass embraces three things; *Key-note*, *Slides*, and *Melody*.

KEY-NOTE.—Key-Note in elocution is the standard pitch ot the voice used in reading and speaking. It is of three degrees; High, Low, and Medium. These are not absolute but relative distinctions of pitch. Different voices differ naturally in pitch, and what is medium to one voice, may be high or low to another; and the medium pitch of any one voice will range through several notes.

Voices are of two general classes with respect to pitch; men's and women's voices. These differ in pitch one octave, women's voices being an octave higher than men's voices. Women's voices are of two general classes; Soprano, a high female voice, and Alto, a low female voice. There is also a voice, sometimes met with, between these two, called Contralto. The soprano is the finest voice for singing; but the alto and contralto voices are usually the most effective in reading.

Men's voices are also of two general classes; Tenor and Base. Tenor is a high male voice; Base is a low, deep, male voice. There is also a voice intermediate between these, called Baritone. The base voice is the most impressive in reading and speaking, and is especially adapted to solemn and grave delivery, as in reading the church service, etc. The tenor is capable of more variety, and, while less impressive than the base voice, is less tiresome to the listener. The baritone is often less musical than either of the others, and less serviceable either in reading or speaking; though a rich and flexible baritone is the best of all voices for oratory.

How Teach.—A pupil should be drilled on exercises to give him complete mastery over the pitch of his voice. First, he should practice singing the musical scale. Second, he should be required to give the elementary sounds on different degrees of the scale, beginning at a low pitch and ascending gradually as high as he can speak with ease, and then gradually descending to the lowest pitch. Third, he should be required to repeat sentences on different degrees of the scale, and to read selections which require variety of pitch. Such a drill will enrich the voice and give him complete command over its pitch in reading or speaking.

Principle.—Pupils should be led to see the relation of the different degrees of pitch to the different varieties of sentiment. There is a natural relation between the pitch of the voice and the emotions of the heart. Deep feeling requires low tones; joyful and elevated feeling requires a higher tone of voice; and sorrow and pity, though requiring soft force, are also expressed by the higher notes of the scale. All ordinary and moderate emotions incline to the middle range of the scale.

The general principle to guide in the adaptation of the pitch of the voice to the sentiment may be expressed as follows: Determine the standard pitch by the general spirit of the piece; if the general spirit is unemotional, the standard pitch is medium; if the general spirit is animated, joyous, or pathetic, the standard pitch is high; if the general spirit is noble, grave, dignified, etc., the standard pitch is low.

Correct Errors.—There are several classes of errors in regard to pitch which require to be corrected. Many pupils pitch their voices too high in reading and reciting. This is especially the case with young lads of a joyous and lively temperament. It is also a common fault of teachers in explaining to their pupils, in reading problems in arithmetic, etc. Many public speakers speak in too high a key, and too many persons do so in ordinary conversation. A high pitch is unpleasant to the cultivated ear, and is totally inadequate to the expression of sentiments of veneration, dignity, or sublimity.

A few pupils pitch their voices too low, though the fault is somewhat rare in school. A few public speakers also habitually use a grave and hollow tone of voice, and thus impart a deep and sepulchral solemnity to all subjects alike.

Most pupils and readers do not adapt the pitch to the sentiment, reading all things with about the same degree of pitch. Falling into this habit, they use the same tone in all varieties of subjects, and read a notice of a Sunday-school celebration with as deep a solemnity of tone as they would use in announcing the death of a member or preaching a funeral sermon.

Many, again, do not discriminate between pitch and force. Tell them to read lower, and they read softer, and perhaps pitch the voice higher. All errors should be corrected with great care. The pupil should be taught to see the relation between the pitch and the sentiment to be expressed, and then be required to adapt the voice to the nature of the piece read or recited. Those who speak habitually too high may be given a pitch of the scale to use as the key-note of a piece. Some of the ancient orators used to have a person back of the stage to sound the key-note as they passed from one part of their speech to another.

Slides.—Slides, or Inflections, are variations of the pitch of the voice on different words or syllables of a sentence. No two successive words or syllables of a sentence are usually uttered with the same pitch of voice; and the pitch of the voice in ordinary natural expression usually varies in pronouncing each word and syllable. We begin a word with a certain pitch and end it in either a lower or a higher key. In natural expression, the voice moves *concretely* on words and syllables, through the interval from one degree of pitch to another. Such variations of pitch are called *Slides.*

Slides are of three different kinds; Rising Slides, Falling Slides, and the Circumflex. The Rising Slide is an upward slide of the voice; it is often indicated by the acute accent (′). The Falling Slide is a downward slide of the voice; it is often indicated by the grave accent (‵). The rising inflection denotes hesitation or incompleteness of expression; the falling inflection expresses decision and completeness of expression.

The Circumflex is a union of the rising and falling inflection. It is called *Direct* when the first interval ascends; *Inverted* when the first movement descends. It is said to be Equal when the two slides are of the same degree, and Unequal when they are of different degrees. It is called Single when two intervals only are joined, as (V); and Double, when there are more than two, as (W).

The use of slides and inflections is to give variety, beauty, and significance to speech. In connection with force, they constitute emphasis, and thus give prominence to the emphatic ideas. In emphasis, it will be noticed, we have not only more force, but longer slides. Slides give variety to speech, for without it our reading would be monotonous and wearisome. They add the charm of melody or music to our utterances, and thus render our reading or speaking more pleasing to the ear.

Slides may be of various degrees. Thus, the voice may vary a second, a third, a fourth, etc., as far as the octave. The Second is the rise or fall of the voice between any two degrees of the scale. Seconds are both major and minor, as previously explained. The term second, in reading, is usually applied to the major second. Thirds are also both major, as from the first to the third of the scale, and minor, as from the sixth to the eighth of the scale.

The Second is the basis of correct and agreeable elocution

It is more used than any other interval, being appropriate to those parts of discourse which convey the plain thoughts of the speaker rather than those which express passion and excitement. The second is the least obtrusive interval of the scale, and is the simple sign of the unexcited sentiment of wisdom and truth. "The simple rise and fall of the second," says Dr. Rush, "and perhaps its wave, when used for plain narration, or for the mere statement of an unexcited idea, is the only intonated voice of man that does not spring from a passionate or an earnest condition of his mind."

The slide of the Third is used for more earnest and animated discourse than the second. The Downward Third expresses considerable feeling, though somewhat subdued and dignified. In simple narrative, it is often used with the second, in giving emphasis to the prominent words. The Rising Third is used in asking questions, and also for emphasis. It is the sign of interrogation in its most moderate form, and denotes but little earnestness or animation in the inquiry The Minor Third is used in the emphatic words of pathetic utterance; as "Little Nell was dead. She died last night."

The slide of the Fifth is used for very earnest and animated discourse. The Downward Fifth is employed in expressing surprise, admiration, and dignified command. It indicates strong emotion, but under the influence of the will and without the excitement of passion. The Rising Fifth is used for earnest interrogation, or for the emphatic expression of inquiry or doubt. Very few inquiries need a longer slide than the fifth. Any larger interval, on account of the difficulty of managing the voice, loses instead of gaining in force of expression.

The Octave Slide is used for the most earnest and animated discourse. The Falling Octave expresses the highest degree of admiration or astonishment. and the most positive command. Very few pieces of composition require the octave, and in all ordinary utterances it would seem exaggerated and

9—

inappropriate. The Rising Octave expresses the most forcible degree of interrogation and of emphasis on a rising interval. It is appropriate for the expression of contempt, mirth, raillery, and of peevish or indignant argument. When employed in ordinary or moderately earnest discourse, it becomes ludicrous. Slides on the other degrees of the scale are so seldom used that they are not described.

How Teach.—Pupils should be drilled on the slides until they can give them readily of any kind and degree. The vocals of the list of the elementary sounds, may be used for this purpose, and also well selected sentences. Some good teachers use the violin in training the ear and voice in the matter of slides. The teacher, of course, should be able to give them well himself as a model for the imitation of his pupils.

In order to apply a principle with respect to slides, all ideas may be divided into two classes; positive ideas and negative ideas. Positive ideas are those which are used in affirming, denying, or making an inquiry in a positive form. Negative ideas are those which do not affirm or deny positively, which are in contrast with positive ideas, or which are used in asking a direct question. The former denote something completed and definitely *laid down;* the latter indicate something incomplete, unfinished, or *held up* for further consideration. Such ideas have been regarded as direct, while those which are neither positive or negative have been called "crooked ideas," as those of jest, sarcasm, irony, etc.

The general principle is,—All positive ideas should have the falling slides; all negative ideas should have rising slides; and all crooked ideas should have the circumflex slides. Thus, all assertions or denials or questions containing a spirit of assertion or denial should have downward slides; all questions desiring an answer should have rising slides; while irony, ridicule, insinuation, etc., require the circumflex slide.

The degree of the slide is determined by the nature of the sentiment. Unemotional pieces have short slides; bold, dignified pieces have long slides. Very pathetic pieces require minor slides. These principles govern the majority of cases; but it should be remembered that the slide is largely subject to the demands of variety, melody, and to the relations of the different parts of the sentiment expressed.

MELODY.—Melody is a series of simple sounds so varied in pitch as to produce a pleasing effect upon the ear. Melody in reading is an agreeable variation of the pitch of the voice on and between the successive words and syllables of a sentence. It will be noticed that in natural expression there is a difference of pitch between words and syllables as well as a variation of pitch on them. The pitch of voice at which any word begins is a little lower or higher than the pitch at which the previous word ends. The term *melody* includes this variation, and is also generally used to embrace the entire variation of the pitch of the voice in reading or speaking.

The object of melody is to give beauty and variety to reading. It is the musical element of speech, and imparts a grace and charm to utterance, preventing monotony, and giving delight to the ear. Its absence leaves the wearisome effect of the unvarying monotone. It also enables the voice to rise or fall gradually on the unemphatic words, that it may have an opportunity for longer slides on the emphatic words.

There are two distinct kinds of melody; Diatonic and Semitonic. Diatonic melody is a variation of a major second on and between successive words and syllables. Semitonic melody is a variation of a minor second on and between successive words and syllables. The absence of melody produces Monotone. Monotone is a sameness of pitch on and between successive words and syllables.

Diatonic melody is used for the expression of all sentiment except the very pathetic or sublime. It indicates manly confidence and the self-reliance of truth. Semitonic melody is used in very pathetic discourse. It expresses complaint, pity, grief, plaintive supplication, and the like. A misplaced use of the semitone leads to whining. It is difficult to give semitonic melody with artistic effect; and when overdone, it awakens feelings of the ludicrous.

The Monotone is used in expressing grandeur of thought and sublimity of feeling. It is used in expressing fear, vastness, majesty, power, etc., sentiments which seem to partially obstruct or overawe the powers of utterance. The effect produed by it is deep and impressive. When properly employed, the reading will be characterized by a solemnity, dignity, and grandeur, entirely in harmony with the sentiments expressed.

Cadence.—Melody gives rise to what is called the *Cadence.* Cadence is the closing tone of a sentence. The completion of a thought is expressed, not only by the long pause which takes place at the end of a sentence, but usually by a falling of the voice on the closing words to a lower pitch than that which prevailed in the body of the sentence. This closing descent in the tone is used to prevent the abruptness and irregularity of sound which would be produced by continuing the prevailing pitch to the close of the sentence. It is a prophecy of a close. prepares the mind for it, and thus avoids that surprise which would be at variance with both harmony and meaning.

The note to which the cadence falls and the space through which it descends, are dependent on the emotion which is to be uttered, or on the length or complication of the sentence. In strong emotion, the cadence is often both abrupt and low; as, "Let us do, or die." In gentle emotion, the cadence is gradual and moderate; as, "How sweet the moonlight sleeps upon this bank." In short sentences, where the emotion is slight, the fall is slight; as, "Night brings out stars, as sorrow shows us truth." In long sentences, the fall is more obvious and begins further from the close.

How Teach.—Pupils should be drilled on the elementary sounds and suitable exercises until they are familiar with melody. The teacher should be skilled in it himself, that he may present suitable models for imitation. The principle is indicated above in speaking of the adaptation of the different kinds of melody to the various kinds of composition.

Principle.—We determine the melody by the general spirit of the piece; all ordinary sentiment requires diatonic melody; very pathetic sentiment should have semitonic melody; and very sublime discourse may be given with the monotone. To allow for emphasis we should let the voice ascend on the unemphatic parts of the discourse so that we may have room to slide downward on the emphatic ideas.

Correct Errors.—Some of the more common faults of cadence are the following: *Delaying the fall of the voice* till the last word or words of the sentence, and dropping at once from a preceding uniform tone. This is a common fault with children, or with pupils reading what they do not understand.

Falling very low in the closing phrase. This fault is contracted by reading only grave and formal selections, and is frequently heard in the pulpit, and from young people who imitate the ministerial style.

A gradual sliding downward from the beginning of the sentence. Some speakers or readers commence a sentence on a high note with full force, and gradually lower the pitch and diminish the force in the progress of the sentence, until the tone has nearly died away at its close. This fault is often heard in the pulpit. The pupil's attention should be called to any one of these faults to which he is subject, and care be taken to correct the error.

III. Time.—Time has reference to the fastness or slowness in reading or speaking. It includes two things; Movement and Pauses.

Movement.—Movement is the rate with which we read or speak. There are three degrees of movement; Fast, Slow, and Moderate. These of course express relative rather than absolute degrees of time. Some writers also make the distinction of Very Fast and Very Slow.

Moderate Rate is the ordinary rate used in speaking or reading. It denotes self-possession, a complete command of one's powers, and an unexcited state of feeling. It is suitable to unimpassioned language, and is employed in narrations descriptions, and didactic composition.

Fast or Rapid Movement is that which is quicker than moderate rate. It is characteristic of gay, exhilarated, and joyful feelings; and indicates some excitement of mind. It is used in giving utterance to all playful, humorous, and mirthful sentiments, in excited argument, and also in expressing indignation and fear. Very quick or rapid movement is expressive of haste, alarm, confusion, and extreme terror.

Slow Movement is a slower rate than moderate. It is suggestive of repose, grandeur, majesty, vastness, power, and splendor. It is used in expressing the deeper emotions of grief, reverence, grandeur, sublimity, etc., and gives dignity and impressiveness to discourse. Very slow movement is employed in expressing the very strongest and deepest emotions; as, horror, awe, profound reverence, solemnity, adoration, etc. It is especially suitable to many parts of the Bible, and to the discussion of many sacred themes.

How Teach.—Drill pupils on suitable exercises, so that they may be able to have a complete command over their voices with respect to rate. Like a good musician, they should be able to read rapidly or slowly at pleasure. They must be led to see that in order to read slowly, the voice is to be prolonged on the vowel sounds of words, and they should be drilled until they can adopt any rate at pleasure. The importance of such drill appears in the fact that it is more difficult to command the rate of reading than one would naturally suppose. The teacher, of course, should be able to present suitable models for imitation.

Principle.—The principle for rate is as follows: Deter mine the standard rate by the general spirit of the piece. If the general spirit is unemotional, the standard rate is moderate; if the general spirit is animated, joyous, gay, etc., the standard rate is fast; if the general spirit is bold, grave, dignified, etc., the rate is slow. Taking the standard rate for the unemphatic words, give additional time to the emphatic ideas, according to their relative importance.

Correct Errors.—The teacher must also be careful to correct the errors of pupils with respect to rate. Most pupils read too fast. This may be corrected by leading them to dwell on the vocal sounds of the words. With very young pupils concert reading is a useful exercise, as they usually read more slowly when pronouncing the words together. Nearly all young speakers speak too rapidly in debate and declamation, and rapid speaking is a very general fault of extemporaneous speakers.

A few pupils read too slowly, prolonging the words into a drawl. Such must be drilled to speak their words more quickly. Have them shorten the vowel sounds of words. Let the teacher give them lively sentences to read, and endeavor to give vivacity and animation to their style.

Nearly all pupils fail to adapt the rate to the sentiment, reading all kinds of discourse with the same rate. This must be corrected by calling attention to the relation of rate to sentiment, and by unremitting drill.

PAUSES.—Pauses are cessations of the voice in reading and speaking. They are the intervals between the utterance of words, clauses, sentences, and paragraphs, which correspond with and mark the divisions of meaning.

There are two kinds of pauses; the Grammatical and the Rhetorical. The Grammatical Pauses are those which indicate the logical or grammatical relation of the different parts of the discourse; they are represented by the punctuation marks. The Rhetorical Pauses are those which are required to bring out the sense or express the sentiment of a discourse; they are not marked, but are determined by the sense of the piece and the judgment of the reader.

Pauses are of great importance in reading and speaking They are required both for ease of utterance and for clear and emphatic expression. They are useful to both the reader and the listener. To the speaker the rhetorical pause is necessary for breathing after uttering a succession of sounds embracing at least one word which demands a great impulse of the organs, and which partially exhausts the supply of breath.

The rhetorical pause is specially important to the listener. A proper pause at the end of a sentence, rests the mind of the hearer, and gives it time to dwell a moment upon the idea or sentiment presented. A pause after an emphatic word gives the mind an opportunity to linger on the idea and receive the full impression from it. As some one remarks, it gives time for the idea "to soak in" the mind of the hearer. It is thus true, in more senses than one, that "a pause is more eloquent than words;" and that though "speech may be silvern, silence is golden."

How Teach.—Pupils should be drilled in exercises to acquire the right use of pauses. Show them the necessity and use of the rhetorical pause. Make them see that the length of the pause depends on the sense, and not on the punctuation. The old method of counting *one* at a comma, *two* at a semicolon, etc., is entirely objectionable. Show them also the use of the emphatic pause, and drill them in using it. Let the teacher give correct models, and correct all errors.

Principle.—The length of the pause depends on the nature of the discourse spoken or read. In unemotional composition the pauses are moderate; in energetic and impassioned utterance the pauses are long in order to give impressive emphasis; in strong and excited utterance they are often short and irregular. Awe, solemnity, grandeur, etc., require long pauses, both at the end of sentences and for emphasis.

Pause in Poetry.—The measured character of verse requires certain pauses not used in prose. These are called the Poetical or Harmonic pauses. The Final pause is a short pause often used at the end of a line to mark its close. The Cæsural pause is that which is used to divide a line into equal or unequal parts. The Demi-cæsural pause is a short pause which is sometimes used to divide the parts of the line already divided by the cæsura. The rhetorical and cæsural pauses usually coincide. When no pause is required, either by the punctuation or the sentiment, the harmonic pause should not be observed.

Reading Poetry.—The chief faults to be avoided in reading poetry are the following: 1. Too rapid utterance, by which the effect of the verse is lost to the ear; 2. A plain and dry articulation, which, though it may bring out the meaning, does not indicate the beauty of the sentiments and the rhythm; 3. A mechanical observance of the harmonic pauses, without regard to the meaning; 4. A mouthing and chanting tone, producing the effect of bombast and mock solemnity; 5. A sing-song style, as frequently heard in the school-room.

Poetry should be read a little more slowly than prose, with a moderate prolongation of vowel and liquid sounds, a slight degree of musical utterance, and with an exactness of time, as indicated by the nature of the verse and the emotion expressed. The utterance should indicate the metre but should never render it prominent.

IV. Quality.—Quality of tone has reference to the kind of voice used in reading and speaking. It is one of the most important elements of vocal expression. The tone itself, independent of the words used, is expressive of thought and feeling. Tone is the language of the heart; the soul can be thrilled by the utterance of melodious and varied sound. A rich, sweet voice will hold the attention of an audience, even when there is no especial interest in the thought expressed. A pleasing voice will cast a charm of feeling and interest around the dullest composition.

All the varied tones which can be uttered by the human voice have been embraced under six classes; Pure, Orotund, Tremulous, Aspirated, Guttural, and Falsetto. These differ in different persons in accordance with the natural quality of the voice, yet they represent distinct characteristics of the voice of each individual.

Pure Tone is a pure, clear, round tone of voice. It is the ordinary tone of a good natural or well-trained voice. All the breath is vocalized, and the tone is produced by a very slight resonance in the head. It is appropriate to all kinds of discourse not strongly emotional.

Orotund is a full, deep, round, chest tone of voice. It is produced by a greater resonance in the head and chest, and requires a depression in the larynx, an opening of the throat, extension of the mouth, and expansion of the chest. It is appropriate to the expression of sentiments of dignity, grandeur, etc. It is employed in reading epic and dramatic poetry, and is indispensable in oratory.

Orotund quality admits of three degrees; Effusive, Expulsive, and Explosive. Effusive Orotund is used in the utterance of sentiments of solemnity and pathos, when mingled with grandeur and sublimity. It is also the appropriate tone of reverence and adoration.

Expulsive Orotund belongs to earnest and vehement declamation, to impassioned emotion, and to any sentiment uttered in the form of shouting. Explosive Orotund is the language of intense passion. It is heard when the violence of the emotion seems beyond the control of the will, as in a sudden ecstasy of terror or anger.

Tremulous Tone is a vibratory tone of voice. It consists of a vibration of the pitch of the voice in the utterance of a word. It is used in expressing pathetic sentiments, in grief, pity, sympathy, tenderness, etc.; in suppressed excitement; in the trembling tones of old age, and occasionally in the exuberance of joy. A slight tremor often adds a charm to utterance, as the *tremula* in singing and violin playing does to music. It should, however, be used with discretion, being careful that it is not overdone, when it savors of affectation. Dropping in now and then unexpectedly on expressive or tender words, it produces a very fine effect.

Aspirated Tone is a whispered articulation, or a speaking by articulating the breath rather than the voice. It is used to give increased intensity to the utterance of the various emotions. It imparts an air of mystery to a subject, and is thus used in expressing wonder, fear, and in circumstances where the voice is awed into silence. It is sometimes used in giving utterance to scorn, contempt, rage, etc., where the intensity of feeling seems to choke or destroy the power of vocal utterance.

The Guttural is a deep throat tone of voice. It is a depth of utterance so low as to pass beyond the range of pure tone. It is used in expressing hatred, contempt, loathing, etc.

The Falsetto is that peculiar tone heard in the higher degrees of pitch after the natural voice breaks or apparently transcends its range. It is used in the expression of extreme surprise, mockery, etc., and in the emphatic scream of terror, pain, etc. The most common use of it is with men in imitating female voices.

How Teach.—Drill the pupils on exercises until they can readily give all the various kinds of tone. Lead them to see the adaptation of the tone to the sentiment. Correct all errors in respect to the quality of the voice. If there are any natural defects of quality, point out the errors and endeavor to have the pupils correct them. Have them imitate the teacher, and apply the principles. The principles are given in the statements of the natural relation of the quality to the sentiment to be expressed.

III. The Physical Element in Reading.

The Physical Element is that which pertains to the body and its members. It is, as it were, the addition of visible language to oral expression, and is thus used to give emphasis and impressiveness to the spoken words. It includes Breathing. Posture, Gesture, and Facial Expression.

I. Breathing.—In order to read or speak well one must know how to breathe correctly. It is an element of great importance, and one which has been greatly neglected. Many public speakers ruin their voices merely because they do not know how to breathe. Teachers' voices "give out" because they make the muscles of the throat do the work of the sides and waist. Preachers are on the retired list with bronchitis who might have preached half a century, if they had known how to breathe properly. We present the following suggestions upon this subject:

How to Breathe.—Breathe deeply. Some people breathe merely with the upper part of the lungs. Let the entire lungs be brought into action. Breathe all the way down to the waist. Let the diaphragm be lowered, let the muscles of the back and the sides be brought into action, and let the waist be enlarged, even at the sacrifice of tight clothing and a false ideal of beauty. Such an exercise will be of great value to weak lungs as well as to weak voices.

Use no more breath in speaking than is needed. Very little breath is vocalized in speaking or reading, as may be seen by holding a piece of tissue paper hung by a silken thread, before the mouth, when speaking. The paper will scarcely move except in uttering the aspirates. Let the breath, therefore, be used with economy to insure ease and freedom of utterance There is no need of pupils getting out of breath in reading or speaking, and the puffing and blowing of some speakers is not only unnecessary but ridiculous, reminding one of the spouting of a porpoise.

Be careful not to mix the breath with the voice. This is a fault occasionally met with among young pupils, and is a serious error in delivery. "Every tone," says Madam Seiler, "requires for its greatest possible perfection, only a certain quantity of breath, which cannot be increased or diminished without injury to its strength in the one case, and its agreeable sound in the other." The use of too much breath mars the beauty of utterance and exhausts the reader.

In breathing, the air should be inspired through the nose, and not through the mouth. A speaker who takes in air through his mouth will find his throat becoming dry by the evaporation of the mucus, or natural moisture with which nature lubricates the vocal organs. Besides, if there are any irritating particles in the air, they will produce an irritation and titillation in the throat.

II. Posture.—Posture has reference to the position of the body and its members. The position of a person in reading or speaking is a matter that should not be overlooked. A person's appearance before an audience has much to do with the attention with which people listen to what he says. Anything awkward, clownish, or affected in the attitude, will naturally prejudice an audience against a reader or speaker.

Elements of Posture.—Posture includes the position of the *feet*, the *hands*, the *head*, and the *body*.

The Feet.—The feet should be placed at an angle with each other, the weight of the body resting on one foot instead of on both. The foot not sustaining the body should be thrown slightly forward of the other, in such a position that if drawn towards the other, the heel of it would come to the hollow of the other. The foot which sustains the weight should be so placed that a perpendicular let fall from the pit of the neck would pass through its heel, the centre of gravity of the body being, for the time, in that line. The sustaining foot is to be planted firmly, the leg braced but not contracted, the other foot and limb being relaxed and resting for change. The weight should be occasionally changed from one foot to the other, care being taken that the transition be gently and easily made. The characteristics of a good attitude are thus firmness, freedom, simplicity, and grace.

Another position of the feet is that in which the toes are on a line, the feet being slightly inclined to each other, the toes turning outward. There are persons with some peculiarity of the shape of the legs or feet, to whom this position is more suitable than the one previously described. This position is usually more becoming to short than to tall persons, and is especially suitable to children.

The errors of position are: continually changing the weight of the body from one foot to the other; swinging to and fro; jerking the body forward at regular intervals, or after every emphatic word; crossing the feet or the legs; turning in the toes; standing with one foot on a stool or chair round, etc. An over-nicety in regard to position that attracts attention is also objectionable. Care should be taken to avoid all these errors. The posture should be equally removed from the awkwardness of the rustic and the affectation of the dancing-master. It should be natural, free from any bad habits; and will thus be both easy and graceful.

The Hands.—The hands should hang naturally and easily down at the side, except when they are being used for gestures. The fingers should be slightly bent and just touch each other, and the thumb should be parallel to the fingers. Gentlemen sometimes place one hand at the waist, supported by the vest or buttoned coat, and ladies often read and recite with one or both hands at the front of the waist. These positions are perhaps not very objectionable, but are regarded as less elegant than when the hands are at the side. When a book is used in reading, it should be generally held in the left hand so that the right is free to turn the leaf.

The errors in the position of the hands are those of *place* and *form*. The errors of the first class are,—putting the hands in the pockets, placing them on the hips, playing with a button or the watch-guard, or with any portion of the dress, frequent changes as if the person did not know what to do with the hands, etc. The errors of the second class are,—spreading the fingers, closing the fingers too tightly, sticking out the thumb, straightening out the hand, closing the hand into a fist, etc. The teacher should carefully note and correct all errors, and secure a natural, easy, and graceful position of the hands.

The Head.—The head gives the chief grace to the person, and is an important element in delivery. The position of the head should be erect and natural. It should not droop, which indicates humility or diffidence; nor be thrown back, which indicates arrogance and pride; nor be inclined to one side, which indicates languor, indifference, or clownishness; nor be held too stiff, which indicates a lack of ease and self-possession.

The Body.—The position of the body should be erect, easy, and natural, with the breast fully fronting the audience. The shoulders should be thrown gently back, so as to give the fullest freedom and capacity to the organs of the chest. The errors to be avoided are, leaning forward or backward, rounding the shoulders, leaning to one side, and being too rigidly erect.

How Teach.—In teaching posture, the teacher should himself be able to present a model for imitation. He should be careful to correct all errors of feet, body, head, arms, hands, etc. He should also make his pupils familiar with the principles of posture. There is a natural language of posture, a language common to all times and races. For these principles, see works on Elocution.

III. Gesture.—By Gesture is meant the movement of the body and its members. It is a visible manifestation of thought and sentiment which accompanies its oral expression. Gesture is one of the most important concomitants of elocution. Some writer remarks, "In the natural order of passionate expression, looks are first, gestures second, and words last." Demosthenes, when asked what are the requisites of an orator, replied, "Action, action, action."

Gesture is the natural language of thought and sentiment. It is a universal language, understood by all people. No matter what their speech, all know the meaning of gestures, and can communicate with one another thereby. An entire play can be presented in pantomime so as to be fully understood. Gesture is visible language, apparent to the eye as the spoken sound is to the ear. When combined with speech, it is thus easy to see how it enforces the sentiment expressed. Indeed, it was a matter of dispute between Roscius and Cicero which could produce the greater effect, the former by gesture, or the latter by spoken words.

Gestures may be divided into three classes; those of *Location*, *Illustration*, and *Emphasis*. Gestures of Location are designed to indicate the position of the object or idea referred to. Gestures of Illustration are designed to show the way in which something appeared or was affected. Gestures of Emphasis are designed to give greater intensity to the meaning of words or sentences by physical movements.

Elements of Gesture.—Gesture, in its fullest sense, includes the Bow, and the position and movement of the Head, the Eyes, the Arms, the Hands, the Body, and the Legs and Feet.

The Bow.—The *Bow* of a speaker should be graceful, easy, and dignified. It should be free from a careless, jerking abruptness, and from a formal, unnecessary flourish. It should not be too low, so as to seem overdone, nor too short, so as to seem trifling or disrespectful. It should not be a mere nod of the head, but the entire body should be slightly included in the movement. The body should be bent directly forward, and not on one side. The foot may be slightly drawn back, or not, as is preferred. Some teachers prefer that there shall be a step backward subsequent to the bow; but this is a matter of taste, and is not essential.

The Hands.—The Hands are the most important members in gesture. As Quintilian remarks, these almost speak themselves. "By them we ask, promise, call, dismiss, threaten, supplicate, detest, fear; display joy, sorrow, doubt, acknowledgment, penitence, manner, abundance, number, time." "So that amid the great diversity of language among all races and nations, this appears to me to be the common speech of all men."

The *Form* of the hand in making gesture should be natural and unconstrained. The fingers should lie near one another, slightly curved, the thumb being parallel with the fingers. The gesture with the forefinger is sometimes appropriate, and is very expressive when the finger is long and slender. A gesture with the fist is very seldom allowable. The errors of gesture are, fingers straight and rigid, too much apart, too closely pressed together, thumb projected from the hand, etc.

The *Position* of the hand in an ordinary gesture of emphasis, should be a little above the waist, between the waist and shoulder. In referring to anything above one, or to grand and lofty sentiments, it should be elevated; in referring to anything situated low, or to any low, debased sentiment, etc., it should be below the ordinary position.

The *Movements* of the hand should be graceful and in good taste. The hand should be raised in curved, and not in straight lines; and the movements should also be in gently curving lines. Gestures will thus embody the elements of grace and beauty. Care should be taken that the movements and transitions be not abrupt or angular. After a gesture, the hand should fall gently and naturally to its place, and not go down with a jerk, or with an awkward restraint.

The Arm.—The Arm, when not used in gesture, should hang naturally at the side. In gesture, the elbow should be slightly bent, except in the most emphatic gestures, when it may often be rigid and straight. Care should be taken not to exhibit an angle at the elbow.

The Eyes.—The Eyes, which are an important element of expression, should generally be directed as the gesture points, except when we wish to condemn, refuse, or require any object to be removed. The eye should rest upon the audience, not with a familiar stare, but with a kindly, modest, and dignified expression. To show a modest confidence in your audience goes very far to secure their confidence and sympathy.

How Teach.—The teacher should be able to present a model in gesture worthy of the imitation of the pupil. He should also make the pupil familiar with the general principles which express the natural relation between the sentiment and the gesture. He should also be careful to correct all awkwardness of manner, inappropriateness of movement, etc.

Principle.—The first principle of gesture is that it should be natural and appropriate. The second principle is that it should be graceful, moving in fluent and connected lines, and not abrupt and desultory. A third principle is that strong, bold, determined, and abrupt expressions require *straight* lines; while all beautiful, graceful, grave, grand, and exultant sentiments require *curved* lines.

We determine the force and extent of the gesture by the sentiment expressed. If the sentiment is unemotional, as in ordinary conversation, the gestures are moderate, the movement being mainly from the elbow. If the sentiment is earnest, lofty, and sublime, as in oratory, the gesture is strong and wide, the arm moving mainly from the shoulder. If the sentiment is highly impassioned, as in dramatic composition, the gestures are still more vigorous and extended.

Correct Errors.—Do not allow too many gestures. Excess of gesture is like redundancy of language, in bad taste and tiresome. Too few gestures are better than too many. Inexpressive or meaningless gestures should be avoided. No gesture should be made without a reason for it. Some speakers accompany nearly every word with a bodily motion, which fatigues the eye and offends the taste. A gesture that illustrates nothing is worse than useless; it destroys the effect at which it aims. When a gesture has been assumed, there should be no change from it without a reason. The habit of allowing the hands to fall to the side immediately after a gesture, produces an ungraceful and restless effect.

IV. Facial Expression.—The face is the mirror of the mind. By nature it reflects promptly all changes of sentiment and feeling. It is therefore one of the most important elements of expression. A voice may be artistic in its modulations, it may attune itself harmoniously to language, but if the soul of the speaker does not shine out from the countenance, much of the power of expression is lost.

All the great speakers and writers on oratory have understood the power of facial expression. Quintilian says, "The face is the dominant power of expression. With this we supplicate; with this we soothe; with this we mourn; with this we rejoice; with this we triumph; with this we make our submissions; upon this the audience hang; upon this they keep their eyes fixed; this they examine and study even before a word is spoken."

Elements of Facial Expression.—The principal features in facial expression are the *eyes* and the *mouth*, though the brow and cheeks aid in expression.

The Eyes.—The eye is the window of the soul. Out of it the soul seems to shine, and the heart can be read by peeping in the eyes. "When there is love in the heart," says Beecher, "there are rainbows in the eyes." "The eye," says Tuckerman, "speaks with an eloquence and truthfulness surpassing speech. It is the window out of which the winged thoughts fly unwittingly. It is the tiny magic mirror on whose crystal surface the moods of feeling fitfully play, like the sunlight and shadows on a still stream." Many writers speak of "the mute eloquence of a look;" and Byron sings of eyes which "looked love to eyes that spake again."

The Mouth.—The mouth is even more expressive than the eyes. The peculiar character of the face is largely due to the size and shape of the mouth. A small mouth indicates secretiveness; a large mouth, open-heartedness and good humor; parted lips indicate listlessness or stupidity; compressed lips are a sign of firmness and decision of character; etc.

The expression of the mouth is due principally to the corners of the mouth. We draw up the corners of the mouth in laughing, and depress them in crying. "To be down in the mouth" is an expressive phrase for low spirits. In a picture the same face may be changed from laughter to weeping by merely making a change in the corners of the mouth.

How Teach.—In facial expression nature must be our guide. The soul must feel the sentiment to be expressed, and the countenance must be the mirror of the soul. The play of features must respond to the sentiment stirring in the heart. The following propositions will indicate the general principles of facial expression.

Unemotional sentiments require the countenance to be in repose. Sentiments of good humor, happiness, etc., require a pleasant and smiling countenance. Bold, grand, and noble sentiments require dignity and animation of countenance. Humorous sentiments require the play of humor in the face; sad and pathetic sentiment should be accompanied with a dejected and softened expression; shame requires the averted eyes and blush of guilt. Determination, anger, and a spirit of defiance are expressed by a contracted brow and compressed lips; in scorn we elevate the upper lip and nose; in fear, surprise, and secresy, the brow is raised, the eyes are opened, and the lips parted.

General Suggestions.—We close this chapter on Reading with two or three philosophical and practical suggestions.

Reading is an Art, and the basis of all Art is Nature. The object of culture in Elocution is therefore *natural expression.* It aims not to eliminate, but to train and improve the natural expression. Everything artificial in expression is regarded as inartistic and distasteful. The reader who "shows his elocution" in his reading, offends good taste, and shows his shallowness of mind and the imperfection of his art. In elocution especially, we should endeavor to attain that excellent standard of culture in which "the highest art conceals art."

We are to look for natural expression in *conversation.* Conversation is the simplest and most common form of human expression. "It contains the *germs* of all *speech* and *action,*" and thus constitutes the basis of all correct delivery. The importance of cultivating correct habits of voice and manner in conversation cannot be over-estimated. Conversation is a beautiful art, and deserves culture for its own sake, and also as a basis of elocutionary culture.

The standard by which we judge of good reading is a *cultivated taste.* Man possesses an æsthetic nature, which when properly cultivated by the influence of natural expression in art, enables him to sit in criticism upon the productions of the artist. Where, through personal idiosyncrasies, tastes seem to differ, we are to be controlled in our decision by the opinions of the majority of cultivated persons.

In conclusion, we urge teachers to remember that elocution is a beautiful art, and worthy of the highest culture. Voice and speech are divine gifts, and should be trained to their highest excellence. As Prof. Shoemaker so well remarks, "It is only the *voice* that has reached its *best,* and the *eye* that beams from the *soul,* and the *hand* of *grace,* and the *attitude* of *manhood* and *womanhood,* that can convey the immortality that has been breathed upon us." As God manifests His glorious attributes in the expression of Nature and the Bible, and above all in the Eternal Word, so may we show the image of divinity in our souls by a pure, natural, beautiful, and artistic expression.

CHAPTER VII.

TEACHING LEXICOLOGY.

LEXICOLOGY treats of the meaning of words. The term is derived from *lexicon*, a dictionary, and *logos*, a discourse. It is usually employed to embrace the origin and significance of words; but it is here used as relating only to the meaning and proper use of words.

The meaning of words is largely taught in all the branches of language. The subject, consequently, does not need a lengthy treatment by itself. No formal study of the subject is suggested for the ordinary common school; but much can be done in all the studies to lead pupils to notice new words, learn their meaning, and fix them in their memory. In the higher classes, oral lessons might be given on the subject; and in advanced schools there should be a regular course of study to teach the meaning and use of words. A few suggestions will be made to guide the teacher in his work.

By their Use.—The meaning of words is taught by *their use in conversation and speaking.* The child first learns the meaning of words from the mother and father and other members of the household. The words he uses have never been explained to him; no definitions have been given him; but he uses them correctly because he has heard them so used. Usage is his guide in using language. If he has been accustomed to hearing a correct and refined vocabulary, he will express himself with correctness and refinement. It is of inestimable advantage in linguistic culture to listen to the conversation of intelligent and cultivated people. It is said that the Gracchi obtained the elegant use of language from their accomplished mother Cornelia; and Aristotle imbibed from his mother "that pure and sweet Atticism which everywhere pervades his writings."

By Reading.—The meaning of words is learned *from reading.* This is one of the most practical ways in which such a knowledge is acquired. In literature we see the correct use of the word, which we cannot always tell from the definition. We also learn to appreciate those nice shades of meaning which cannot be stated in a definition. Pupils who read most have usually the largest vocabulary and the best use of words. Young children will often be heard using the words in their conversation which they have met with in some book recently read; and, if properly taught, their compositions will show the same thing. Children should therefore be encouraged to read extensively and to read the best written works.

Teachers should call attention to the meaning and use of words in the reading lesson. They should require pupils to put the unusual and difficult words into sentences to see that they know how to use them. In this way the word is fixed in the memory, and the child's vocabulary enlarged. The reading class presents one of the very best opportunities for teaching the meaning of words.

By Illustrations.—With young pupils, the meaning of words may be taught *by means of objects or illustrations.* Thus, the meaning of the word *transparent* may be illustrated with a piece of clear glass; the meaning of the word *translucent*, by a piece of ground or painted glass; the word *opaque*, by any object which does not permit the light to pass through it. The best way to teach the meaning of the word *bone* is to show the pupils a bone; and the same may be said of *calyx, corolla, stamen, pistil*, etc. Most of the terms of the natural sciences may be taught in this way, and many of those in the abstract sciences, as the names of the figures in geometry. Object Lessons are especially valuable in this respect.

By Definitions.—The meaning of words may be taught by *means of popular definitions.* The unknown word may be made known by comparing it with one already understood, or by the use of several words which explain it. Care should be taken, however, that the term used in the definition is simpler or better known than the word defined. This is not always the case with the definitions given in our text-books, especially those found in some of our school readers. To define *shorten* as *abbreviate*, or *correct* as *rectify*, or *buying* as *purchasing*, or *belong* as *appertain*, etc., gives the pupil another word for the same idea, but does not give him any new idea of the first word.

The Dictionary.—The meaning of words can be taught by *a careful use of the dictionary.* Pupils, as soon as they are old enough, should be required to make frequent use of the dictionary. This should become a habit with them. The great masters of language made the dictionary their constant companion. Rufus Choate, so eminent for his scholarly use of the English language, was a constant and thorough student of the dictionary.

In the study of definitions, it should be remembered that we cannot always know how to use a word from its definition. Thus *abandon* means to *forsake*, to *give up*, etc.; but it would not be correct to say we "forsake a study" or even "abandon a bad habit," etc. *Abbreviate* means to *shorten*, but we would not appropriately speak of abbreviating a dress or a string or a stick of timber. We must notice the use of words in sentences in order to understand the nice distinctions between them; and definitions should always be accompanied by sentences illustrating the proper use of the term defined.

A pupil should acquire the habit of marking down every new word which he meets, or every word which he thinks is not a part of his practical vocabulary. He should keep a list of such words, frequently refer to them, and make use of them in speaking and writing. He will thus enlarge his stock of words, and learn to use them with readiness and precision of meaning.

From Synonyms.—The meaning of words may be taught by *the study of synonyms.* By synonyms we mean words of the same general significance, yet with slight shades of difference in their meaning. They are words which, with great and essential resemblances of meaning, have, at the same time, small, subordinate, and partial differences. These differences may have originally inhered in them, or they may have acquired them by general usage, or some early and latent meaning may have been awakened by the special usage of some "wise and discreet master of the tongue."

The English language is especially rich in synonyms. This arises from its being a composite language, words for the same thing being derived from different sources. Many of these in time became differentiated and now constitute our synonyms. Thus *motherly* and *maternal*, *fatherly* and *paternal*, *happiness* and *felicity*, *daily* and *diurnal*, *powerful* and *potential*, etc., are pairs of words meaning very nearly the same, the first in each case coming from the Anglo-Saxon and the second from the Latin.

The study of synonyms is especially valuable in learning to use words correctly. It enables the pupil to see those nicer and more delicate shades of meaning by which words are distinguished. It enables them to see in what cases words may be used interchangeably, and where they cannot be; thus we may say *force* of mind or *strength* of mind, but not *strength* of gravitation. It is only by a careful comparison of words that a pupil can use such words as the following correctly: *invent* and *discover*; *only* and *alone*; *enough* and *sufficient*, *avow*, *acknowledge*, and *confess*; *kill*, *murder*, and *assassinate* Crabb's *Dictionary of Synonyms* is an excellent work for such a study, though the subject is quite fully presented in Webster's and Worcester's large dictionaries.

Logical Definitions.—The meaning of words may be taught *by means of logical definitions.* A logical definition is one which defines by means of the class and specific difference, called *genus* and *differentia.* Thus, a *triangle* is a *polygon* of three sides and three angles. Here *polygon* is the *genus*, and *three-sidedness* the *specific difference.* The practice of studying logical definitions tends to sharpen our conceptions of the distinction of words, and to cultivate the habit of careful discrimination in the use of language.

Many terms will not admit of a logical definition. Such a definition is only possible when the genus and specific difference can both be stated. Terms expressing simple ideas cannot be logically defined, because they cannot be resolved into their elements, and are thus without *genus* and *differentia.* Thus, *truth*, *space*, *being*, etc., will not admit of a logical definition. Some terms, though belonging to a genus, cannot be defined on account of our being unable to state the differentia. Thus, in the statement *red* is a *color*, color is the genus, but who can give the differentia, the difference that separates red from the other colors?

Latin and Greek.—The meaning of words may be learned by *the study of Latin and Greek.* The practice of looking in the dictionary to find the English words which correspond to the words in other languages, makes the pupil familiar with the meaning and use of the English words. The constant use and comparison of words, necessary in translation, give linguistic accuracy and a facility in their use. The process of translating cultivates that fine literary sense by which the delicate shades of meaning among words are perceived and appreciated.

From Etymology.—The meaning of words may be taught by *the study of Etymology.* A knowledge of the origin of a word sometimes aids us in understanding its meaning and use. Thus it adds to our idea of the word *Education* to know that it means to *draw out*, *e* and *duco*, and also *subtraction*, to know that it means to *draw from under*, *sub* and *traho.* The etymology often enriches and enlarges the meaning of a word, and puts an expressiveness in it by the image it brings before the mind as we use it.

We cannot always use a word correctly, however, by knowing its etymology. Indeed, the etymology of a word would usually lead us astray in its use. Thus the word *subtraction*, even, could not be used in its literal etymological sense of *drawing from under*. The same may be said of *right*, *wrong*, *conduct*, *normal*, and a multiplicity of words which could be named. The principal use of etymology, aside from the interest and intrinsic value of the knowledge, is that it puts into the mind a concrete image which seems to add force or emphasis to the meaning of a term.

There are two methods of teaching etymology; the *Analytic Method* and the *Synthetic Method*. The Analytic Method begins with the word as a whole and separates it into its etymological parts, showing the meaning of the parts, and thus the meaning of their synthesis in the word. Thus, after the child is familiar with the word *subtraction*, it may be shown that it consists of the three parts, *sub* meaning under, *tract* from *traho*, I draw, and *ion*, the act of. A large number of words may be analyzed in this way as they occur, and a knowledge of the elements be reached through the words.

The Synthetic Method begins by teaching a list of prefixes and suffixes and roots, and then unites them in forming words. Thus, after committing elements, the pupil may be shown that *sub* and *tract*, a modification of *traho*, and *ion*, give the word *subtraction*. In actual practice, there is a sort of analysis of each word into the elements which have been previously learned; but the spirit of the process is synthetic, since it passes from the elements to the word containing them.

Of these two methods, the analytic is the better for beginners. It is the more interesting method; the committing of a list of roots is rather dry work. It is also in accordance with the law of instruction, *from the known to the unknown;* while the synthetic method inverts this law. It also begins in the concrete, while the other is abstract. For advanced pupils the synthetic method may be preferred, as it is more formal and thorough in its procedure.

Teachers should take pains to call the attention of pupils to the etymology of words. Even some incidental instruction of this kind will give the pupil a knowledge of the elements of a large number of words; and, what is better, cultivate a taste for etymology. They should not restrict their instruction to Latin and Greek elements, but should call attention to the Saxon elements also. Such words as *England*, *wife*, *husband*, *knave*, *heathen*, etc., will be full of interest to children. Every teacher should have a copy of "Trench on the Study of Words," and besides this it would be well for them to read Max Müller, Whitney, Schele de Vere, etc.

CHAPTER VIII.

TEACHING ENGLISH GRAMMAR.

GRAMMAR is the science of sentences. English Grammar is the science of the English sentence. It treats of the relation and construction of words in sentences. In other words, grammar is the science of the sentential use of words. The term *grammar* seems to have been derived from *gramma*, a letter, which came from *grapho*, I write.

Grammar has sometimes been defined as "the science of language." This definition includes too much, for there are several other branches of language coördinate with grammar, as Rhetoric, Etymology, Philology, etc. It is sometimes defined as "the science which teaches us to speak and write the English language correctly;" but this also includes too much, as other branches aim at the same result. A sentence may be grammatically correct and still be incorrect in regard to other departments of language. Besides, it is not proper to define a science as "that which teaches" something.

There is so close a relation between grammar and the two branches, Rhetoric and Logic, that it is difficult to state clearly the distinction between them. Logic is the science of thought; but since this thought must be expressed, Logic deals also to some extent with the expression of thought. Rhetoric also treats of the manner in which thought and sentiment are expressed. Popularly we may say,—Logic teaches clearness of expression; Grammar, correctness of expression; and Rhetoric, effectiveness of expression. Fowler, in attempting to distinguish these three branches, says: "Logic deals with the *meaning* of language; Grammar with its *construction;* and Rhetoric with its *persuasiveness*. Logic plans the temple; Grammar builds it; Rhetoric adorns it." It is clear that since thought determines expression, the science of logic is very intimately related to a full understanding of the subject of Grammar.

The term Grammar was formerly used in a broader sense than at the present day. In its widest acceptation, and this was its primary use, it included all verbal expression of the products of the mind. Trench says, "Grammar is the logic of speech, even as Logic is the grammar of reason." It has also been used to signify a treatise on the elements or principles of any science; as, a "grammar of geography," a "grammar of arithmetic." The term has, however, become differentiated so as to be now restricted to the sentential use of words.

I. General Nature of the Subject.

I. Nature of Grammar.—To aid the student in understanding the methods of teaching grammar, we shall present a brief statement of the nature of the science. A conception of the subject of grammar may be presented in two ways; first, by considering the office of the individual words in a sentence; and second, by resolving the sentence into the thought elements which enter into its structure. The former is called the Etymological view of grammar; the latter is called the Logical view of the subject.

Etymological Elements.—Language is made up of individual words. These words are all embraced under a few general classes, some eight or ten, called Parts of Speech. Each one of these parts of speech performs a certain office in a sentence, and some perform two or three offices.

Parts of Speech.—The first and simplest class of words are those which are the names of objects, called *Nouns*. There are also words expressing some action or state of the objects named by these nouns, which are called *Verbs*. Then there is a class of words, usually expressing qualities, which are added to the nouns to distinguish the objects referred to by the noun; these are called *Adjectives*. Then we have a class of words used to distinguish the actions expressed by the verbs, called *Adverbs*. The words used to distinguish the qualities expressed by adjectives and by adverbs are also called adverbs.

Then there is a class of words used for nouns, called *Pronouns*. There is also a class of words used to connect other words and show the relation between them, called *Prepositions*. We have also words which connect words and sentences without showing any relation between the words connected, which are called *Conjunctions*. There are words also which express feelings or emotions, which on account of their being thrown into the sentences formed by other words, are called *Interjections*.

Properties of Parts of Speech.—These parts of speech have certain relations to one another and to the things which they express, that give rise to certain changes in their form or meaning. These changes in form are called *Inflections*, from *flecto*, I bend, since the form of the word is changed, as in bending an object we change its form. Words which admit of such changes are said to be *declinable*, from *de*, down, and *clino*, I lean or incline. In many cases in the English language there is no change of form to indicate the relation, though the relation really exists, and is thought if it cannot be seen. These are all embraced under the head of the Properties of the parts of speech.

The properties of the Noun are *Number*, *Person*, *Gender*, and *Case*. The properties of the Verb are *Mode*, *Tense*, and *Voice*, and also *Person* and *Number* derived from its subject. The change in the adjective and adverb is called *Comparison*. In some languages the adjective has the properties of number and case, which it seems to have derived from the noun.

Classes of Parts of Speech.—These Parts of Speech admit of various divisions into *classes*, which give us what are called the *Classes of the Parts of Speech*. Thus, Nouns are divided into *Proper* and *Common*, etc.; Verbs into *Regular* and *Irregular*, *Transitive* and *Intransitive*, etc.; Pronouns into *Personal*, *Relative*, *Interrogative*, etc.; Conjunctions into *Coördinate* and *Subordinate;* etc.

Rules of Construction.—From the consideration of the relation of these words to one another, and a careful examination of the usage of cultivated men and women, we derive certain laws of construction, which constitute the Rules of Grammar.

Some Offices.—Then we have certain offices ascribed to the words as *limit*, *modify*, *govern*, etc. One word is said to *limit* another when it limits its application to a part of the class of objects which it represents; thus, in the expression *blue birds*, the word *blue* limits the word *birds* to only a part of the general class of birds. The term *modify* means very nearly the same as limit, one word modifying the application of another word; as in *red roses*, the *red* modifies the application of the word *roses*. By *government* in grammar is meant the power that one word is supposed to exercise over another word to cause it to assume some particular form or meaning.

Logical Elements.—In this statement we have a brief outline of the nature of grammar, derived from the consideration of the individual words in a sentence. There is another method of conceiving the subject, however, which consists in determining the elements of language by regarding the sentence as a unit, and analyzing it into the necessary parts of which it is composed. We state briefly the results of such an analysis.

Principal Elements.—A sentence is an assertion of something about something. Every sentence thus contains two necessary elements; that about which an assertion is made, and that which is asserted. These two elements are distinguished as the *Subject* and the *Predicate*. The Subject may consist of a *single word*, or of a collection of words not forming a proposition, called a *phrase*, or of a collection of words containing a proposition, called a *clause*. Similarly, the Predicate may consist of a *word*, a *phrase*, or a *clause*.

Subordinate Elements.—Continuing the analysis, we find that some elements are used to limit, modify, or describe other elements, and these we call *modifying* or *limiting* elements. When they limit the meaning or application of words used as the names of objects, they are called *adjective elements;* when they limit the meaning or application of words used to express actions or qualities, they are called *adverbial elements.* These elements are often called *adjuncts*, because they are joined to the elements which they limit. To distinguish them from the subject and predicate, they are called *subordinate elements*, the subject and predicate being called *principal elements.* These subordinate elements are, with respect to their form, of three classes; *words*, *phrases*, and *clauses;* and with respect to their use they are also of three classes; *adjective*, *adverbial*, and *objective.*

Connective Elements.—In addition to the principal and subordinate elements, there are also words used to connect the other elements, which are called *connective elements.* We also often find in language words that have no logical connection with the other words; such words are called *independent elements.* This method of looking at a sentence and reaching its elements may be called the *logical method,* in distinction from the other method, which may be called the *etymological method.*

II. Origin of Grammatical Elements.—Having pointed out the grammatical elements of language, the questions naturally arise,—How did these elements originate? Why have we just so many parts of speech; and why are they such as they are? We shall endeavor to give a brief reply to these questions. There are two theories upon this subject; one drawn from the consideration of the operation of the several faculties of the mind, and the other that presented by the writers on logic. These two views, for want of better names, we may distinguish as a New and the Old theory.

A New Theory.—Language is the product of the human mind The thought went out into expression, and thus gave form to the language. In order, therefore, to understand the growth and nature of the grammar of the language, we must look at it through the laws of mental activity.

Parts of Speech.—The faculty of the mind which first awakens into activity is Perception. Perception cognizes *individual things*, and forms *particular ideas.* These ideas we express in *particular words;* hence our first words are *names* which we call *nouns*, from *nomen*, a name. These names are of individuals and are thus *proper nouns*, or have the force of proper nouns. The mind also sees these objects *acting* or *doing* something, which it expresses in the form of *action* or *doing words.* These words are called *verbs*, from *verbum*, a word, because they are regarded as the most important words in a sentence. These verbs, like the nouns, at first express particular actions.

The mind, at first, cognizes objects as wholes, without distinctly noticing their attributes ; but it soon begins to analyze them and to distinguish their qualities ; the naming of these qualities in their relation to the objects, gives us words to distinguish objects, which on account of their being added to nouns, we may call *adnouns;* or, since they are thrown to nouns, they have been called *adjectives*, from *ad*, to, and *jacio*, I throw. The mind also compares actions and notices their differences ; the naming of these differences in relation to the action, gives us a class of words to distinguish actions; which, on account of their being added to verbs, are appropriately called *adverbs.*

The mind in comparing objects, notices these similarities, and brings the similar objects together under a common name; it thus forms general ideas which give rise to general terms or *common nouns.* In a similar manner, the verb, which was at first the name of some particular action, becomes general in its application to a class of similar actions. The adjective and the adverb also become more general as our experience enlarges.

Having obtained general notions, the mind begins to compare these general notions, and perceiving a relation between them, forms judgments, which when expressed, give us the *proposition*. These judgments or propositions need a connecting or affirming word, which gives rise to the *copula* or *neuter verb* as "man is an animal." The affirmation of an attribute of a general notion (regarding the intension of the concept) also requires the use of the copula, as "man is mortal."

As our progress in thought and language continues, it is found convenient to avoid the too frequent repetition of nouns, which we do by the introduction of a class of words to be used *for nouns*, which we call *for-nouns*, or *pronouns*. If it were necessary to have a class of words to avoid the too frequent repetition of the verb, we should have a class of *for-verbs* or *pro-verbs* also, which we seem to approximate in the peculiar use of the word *do;* as "John studies, and so do I."

In order to unite and show the relation of some of the words we use in the construction of sentences, it was necessary to introduce words expressing relations, which we may call *relation-words;* or, since they are placed before the word to be related to some other word, they are called *prepositions*, from *prae*, before, and *pono*, I place. Words used merely to conjoin words and sentences were also necessary, and were called *conjoining words*, or *conjunctions*. Words expressing emotions were also needed, and since these words had no relation to the rest of the sentence, but were *thrown in* abruptly *between* other words, they were called *interjections*, from *inter*, between, and *jacio*, I throw.

The Properties.—We may also account for the origin of the *inflections* or properties of the parts of speech in a similar manner. It was necessary to distinguish between the use of a noun as meaning one or more than one object, and this was conveniently done by a change of termination in the nouns to indicate this meaning, which gave rise to the property of *number* For all practical purposes two forms were sufficient; hence we have only two numbers, *singular* and *plural.* Some nations, however, seemed to find it convenient to distinguish between one, two, and more than two things; and thus arose a third form, called the *dual number.* This dual form is supposed to have been caused by the duality of the parts of the human body, as the eyes, the hands, etc.

Since there were two objects of the same class of animals distinguished by sex, it is natural that words should be changed in their form to distinguish the sex of the object named; and thus arose the property of *gender.* Since a noun could represent the three persons, the speaker, the person spoken to, and the person spoken of, there naturally arose a change of form in the noun to indicate the person; which gave rise to the property, called the *person* of nouns. The different relations that an object may sustain to an action or to another object, caused a change of termination to indicate the relation meant; and this gave the property of *case*, six in Latin and eight in Sanskrit. In our language these relations are principally expressed by prepositions, leaving us only three cases for pronouns, and, some say, only two cases for nouns, the nominative and the possessive. All these properties of nouns would, of course, belong to pronouns as their representatives.

The properties of the verb originated in a similar manner The fact that a verb could be used in commanding, or inquiring, or simply declaring an action, gave rise to the property of the manner or *mode* of the verb. The idea of time and the fact that the action expressed by a verb could take place in different times, gave rise to a change of the verb to indicate these times of an action, which produced the property of *tense.* It was natural for the form of the verb to vary as the number and person of its subject varied and this gave rise to the *number* and *person* of the verb.

The number and person of a verb are not intrinsic, but derivative properties of the verb; and by some grammarians are not regarded as properties at all. A certain writer says that to attribute person and number to a verb is "as anomalous as to assign gender and number to adjectives. Most languages fall into this error, which is, however, susceptible of a very easy historical solution. It arose, doubtless, from the original custom of annexing the pronoun to the termination of the verb, and continuing the use of the inflection after its import had been forgotten, and when the pronoun had been formed into an independent part of speech."

It seems to have been natural, primarily, to express the relation of words by an affix or prefix to the radical portion of the word; these changes seem subsequently to have been replaced by particles. The earlier stage of a language is usually richer in terminations; which drop off as the faculty of abstraction becomes habitual. In a manner similar to that now explained, we can account for every grammatical distinction by a development from the natural psychological operations which give form to language. The different Classes of parts of speech arise from the different offices performed by words of the same general class, and the Rules of Construction grew out of the laws impressed upon language by thought, modified by the circumstances of fashion, etc., which introduced changes into the language of the people.

The Old Theory.—We have thus indicated what we conceive to be a correct idea of the development of grammatical elements from the natural operation of the human mind. There is, however, another view of the subject, drawn from logic rather than from psychology. We will briefly indicate this view.

It is held that the first class of words are *substantives*, so called because they are conceived as *standing under* (*substans*) certain qualities. These qualities may also be considered as substantives, as *whiteness*, *greenness;* but when considered in relation to the substances of which they are properties, they constitute a second class of words, *adjectives* or *noun-adjectives.* A *conception*, or general notion, when formed, is capable of being resolved back into its constituent parts or qualities; and the attribution of a quality to a substance leads to a *judgment;* as "Snow is white," the *sign* of the attribution being called the *copula.* When the quality is combined with the copula, a third class of words is produced, which we call *verbs.* Thus, instead of saying, "the sun *is* bright," we may say "the sun shines." A verb is thus regarded as a compound part of speech, consisting of an adjective and a copula or *affirmation.* These three parts of speech—the *substantive*, the *adjective*, and the *verb*, are called the *primary* or *essential* parts of speech.

The *adverb*, it is said, derives its existence from the difficulty of defining by one word the precise quality of a particular object. Words are needed to indicate the degree of the quality expressed. The primary use of the adverb, it is thus seen, is to modify the *quality* or *attribute* expressed by the adjective and the verb. Prepositions are said to express relations between substances, *objective relations;* while conjunctions may be regarded as expressing *subjective relations*, or those existing between judgments, whether of mere succession, of inference, or the like. The other grammatical elements would be derived very nearly in the manner previously explained.

III. Origin of Grammar.—Grammar originated among the Greeks. It seems to have had its origin about the second century B. C., among the scholars of Alexandria. Many of them were engaged in preparing correct texts of the Greek classics, especially of Homer. The manuscripts differed, and the correct form was determined by a comparison with the language of Homer. They were thus forced to pay attention to grammatical structure, and to observe the laws of construction. The first real Greek grammar was that of Dionysius Thrax, a pupil of Aristarchus. He went to Rome as a teacher about the time of Pompey, and wrote a practical grammar, it is supposed, for the use of his pupils. This work was the foundation of grammar. Later writers have improved and completed it, but have added nothing really new and original in principle.

The earliest scientific investigations of language among the Greeks were not strictly grammatical, but discussed the relation of thought to expression. The distinction of *subject* and *predicate*, and even the technical terms of *case*, *number*, and *gender*, were first used to express the nature of thought, and not the forms of language. The early Greeks had a very slight knowledge of grammar proper. Plato knew the *noun* and *verb*, as two component parts of speech. Aristotle added *conjunctions* and *articles*, and observed the distinctions of *number* and *case*. The word *article* with him, however, meant a *socket* in which the members of the sentence moved, and included many more words than at present. Before Zenodotus, 250 B. C., all pronouns were simply classed as sockets or articles of speech. He was the first to introduce a distinction between personal pronouns and mere articles or articulations of speech. Aristotle had no technical terms, as *singular* or *plural*, and does not allude to the *dual*. Zenodotus seems to have been the first to observe the use of the dual in the Homeric poems, and changed many plurals into duals.

The first attempt at an English grammar was *Paul's Accidence*, an English introduction to Lilly's Latin grammar, written by Dr. John Colet in 1510. Lilly's grammar received the sanction of royal authority and was the exclusive standard in England for more than 300 years. The first book treating exclusively of English grammar was written by William Bullokar in 1586. During the next century, several works on grammar were written, among which are mentioned one by Ben Jonson (1634), one by Dr. John Wallis (1653) in Latin, and one by William Walker (1684), the preceptor of Sir Isaac Newton, also in Latin. In 1758, Bishop Lowth published his celebrated grammar, an excellent work from which Lindley Murray drew most of his materials. Lindley Murray published his first grammar in 1795, and his *Abridgement* in 1797, a work which has been extensively used in this country and in England. The annual sale of the book in England has been estimated at 50,000 copies. This popular work was largely derived from Lowth and Priestley, and owed its popularity to its practical adaptation to the work of the school-room. The number of grammars published in this country is legion; the ablest and most celebrated is that of Goold Brown. The first to develop and give prominence to "grammatical analysis," was Prof. S. S. Greene, of Brown University.

IV. THE TEACHING OF GRAMMAR.—Having spoken of the nature of grammar, the origin of the grammatical elements, and the historical development of the subject, we shall now call attention to the manner in which it has been taught, and the different methods of teaching it.

Grammar Poorly Taught.—Grammar has been more poorly taught than any other branch in the public schools. It has been made too abstract and theoretical. It has been taught as a matter of memory, and not of judgment and understanding. It has been a committing and repeating of definitions, and not a study of the relation of words in sentences. It has been a study of text-books on grammar instead of a study of the subject of grammar. It has been a memorizing of abstract definitions and rules, instead of a practical application of them to the improvement of a pupil's language. It has been a worry and a waste of time and patience; and a labor barren of adequate results. We believe we are correct in saying that more than three-fourths of the time spent in the study of grammar in the public schools, has been worse than wasted.

The result of such teaching is that the pupils of our common schools go out with a much better knowledge of arithmetic, geography, etc., than of grammar. Besides this, the methods of teaching have given pupils wrong ideas of the subject and incorrect methods of studying it. Taught by requiring pupils to commit and recite definitions, they have come to look at the grammar of language through the definitions rather than at the definitions through language. Pupils thus taught not only obtain confused notions of grammar, but often acquire a dislike and even a disgust for the subject.

These errors in teaching grammar arise from two sources; the defects of our text-books and the incompetency of teachers. The books have been defective on account of their beginning with definitions instead of exercises to lead to definitions. They have presented the matter too abstractly. They have not aimed to lead the pupil to apply his knowledge of the subject. They have not been properly graded; and have introduced difficulties before the pupil was prepared for them. They have been constructed on the deductive method of teaching, instead of the inductive method, as all primary grammars should be. A change, however, is taking place in this respect; some of the more recent text-books on primary grammar being a great improvement on the old ones.

The incompetency of teachers, stated as the second cause of this poor teaching, has been not so much in their imperfect knowledge of grammar as in their defective methods of teaching it. Teachers of the public schools usually know enough grammar for their work, but they do not know how to teach it. Having been incorrectly instructed themselves, and having received no instruction in the true method of teaching it, they reproduce the same faulty methods in their own work, and thus the evil is perpetuated.

The difficulty which pupils experience in learning grammar is entirely unnecessary. When properly taught, grammar is one of the easier studies of the common school course. Intrinsically, the elements of grammar are less difficult than the elements of arithmetic: a knowledge of grammar, such as is contained in an ordinary common school text-book, is much more readily acquired than the same amount of arithmetic

Grammar can also be made one of the most interesting studies of the public school, by teaching it according to a proper method. I have never seen children more interested in any classes than in the primary grammar class when correctly taught.

Methods of Teaching.—There are two distinct methods of teaching grammar; the Synthetic or Etymological Method, and the Analytic or Logical Method. The Synthetic or Etymological method begins with the *words*, regarded as *units of language*, and proceeds to *sentences.* It regards the words as *parts of speech*, denoting *objects*, *actions*, *qualities*, etc., and not as logical elements of thought. It is called Synthetic because it proceeds from words to their combination in sentences. It is called Etymological because it deals with the parts of speech as words.

The Analytical or Logical method of teaching grammar begins with the *sentence* as the *unit of language*, and analyzes it into its *thought elements.* It considers the sentence as consisting of two principal elements, the *subject* and *predicate*, passes from these to *subordinate* and *connective* elements, and at last reaches the words as parts of speech. It first regards words *not as parts of speech*, but as expressing the *logical elements* of which a sentence is composed. It is called Analytical, because it passes from the sentence as a whole to the parts composing it. It is called Logical, because it deals with the logical elements out of which sentences are composed.

The difference between these two methods is radical and important. Thus, by the former method, a *noun* is taught as a *name;* by the latter method it is regarded as expressing *that of which something is said.* By the former method a *verb* expresses an *action* or *doing;* by the latter, it expresses *what is affirmed or asserted* of the subject. An *adjective*, by the former method, is the name of a *quality* of an object; by the latter method it is regarded as a word which *limits the extent* of a general conception or the application of a general term. Thus, by the logical method, *good*, in the expression, *good boys*, is not regarded as expressing the *quality* or *kind* of boys, but as limiting the concept boys to a portion of its extent, or the term boys to part of the class. So the *adverb* limits the general action to some particular action: thus, in the sentence, *The bird flies swiftly*, the flying, which, without the adverb *swiftly*, would include all kinds of flying, is here limited to a particular kind of flying; namely, *swift* flying. By the Etymological method, the preposition is taught as expressing the *relation* of objects; by the Logical method it is taught as the *connecting part* of an adjunct or subordinate element.

It should be observed that the two methods are not distinguished merely by one beginning and the other not beginning with a sentence. We may begin with a sentence and teach by the etymological method, by regarding the words of the sentence as parts of speech. In teaching by the synthetic method we should use the sentence as well as by the analytic method. The essential difference is not in the use or non-use of the sentence, but in the manner of using it. In one case we begin with the words as parts of speech; in the other case we begin with the logical elements of a sentence, and come down to the words as parts of speech through these logical elements.

The Correct Method.—In teaching grammar, neither one of these methods should be followed exclusively, but they should be judiciously combined. Both are needed to give a complete knowledge of grammar, and each will aid the other in giving clearer ideas of the subject than can be obtained by either one alone. From a generalization of the use of words as parts of speech the pupil is naturally and easily led to grammatical analysis; and from some of the distinctions in grammatical analysis much clearer notions of the correct use and relation of words as parts of speech can be presented. Both methods are, therefore, essential to a complete system of grammatical instruction, and they should go hand in hand in unfolding the subject in the mind of the learner.

The etymological method will serve as a valuable introduction to the logical method. The use of words as the elements of sentences will prepare for the use of collections of words as expressing these elements. Thus from the use of single *words* as parts of speech, the pupil is easily led to see that *phrases* and *clauses* may perform these same offices. From a *word* used as a *noun* or an *adjective* or an *adverb*, etc., it is readily seen how a *phrase* or a *clause* may be used as a noun, adjective, or adverb, etc.

The logical method will also be of great advantage in understanding the use of words as parts of speech. Thus the conception of a phrase as a modifier of a noun or a verb indicates the antecedent term of the relation of a preposition, which is not always readily seen without this conception. Much clearer ideas of indirect objects, adverbial objects, relative pronouns, etc., will be obtained by the logical analysis of sentences. Indeed, analysis will aid in giving clearer ideas of nearly every part of the subject than can be obtained by the etymological method alone.

The correct order of these two methods, it would seem, is to begin with the etymological and pass gradually to the logical method. Several reasons can be given for this order. First, the etymological method is simpler in thought than the logical method, and is much more easily understood by young pupils. Second, it coincides with the natural method by which they learn language; *first words, and then sentences.* A little child begins language with words as the names of objects rather than with sentences or propositions. Its adjectives are at first the names of qualities rather than limiting elements of general conceptions.

This order is also to be preferred because it follows the law, *from the particular to the general.* "Grammatical Analysis" is, to a large extent, a generalization of the principles of etymological grammar. Thus, at first, we see that a *single word* is a part of speech, as an *adjective;* and later we learn that a *phrase* or a *clause* may be used as an adjective, and is thus an adjective element of a sentence. The same is true in respect to the *noun*, the *adverb*, etc.; in each case there is a generalization from the use of *words*, to the similar use of *phrases* and *clauses.* The order also corresponds with the historical development of the subject, for "grammatical analysis" is of comparatively recent origin and was a development of etymological grammar.

The proper combination of these methods, it seems to me, is as follows: First, give the pupils an elementary knowledge of words as parts of speech. Second, give the pupils a general notion of the logical analysis of sentences. Third, then present a detailed treatment of the parts of speech including their classes and properties. In connection with this third division have constant exercises in parsing, analysis, and the correction of false syntax. Such a combination of the two methods will produce the happiest results in teaching English grammar.

Principles of Teaching Grammar.—In teaching grammar by either of these two methods, the teacher should be guided in his work by the following principles of instruction:

1. *Teach first by means of oral exercises.* Do not begin by having pupils study definitions from a text-book. No grammar-book is needed for several months, with a class beginning grammar. In an ordinary common school, I should use no text-book on the subject for at least six months or a year. A school reader may be used for examples of parts of speech, for parsing, etc. A text-book in grammar is a positive disadvantage to a beginner. It seems to stand as a partition wall between the pupil's mind and the subject. It causes him to "see through a glass" very darkly that which is simple and clear without the book.

2. *Teach grammar from language and not from definitions.* The old way was to begin with definitions; the correct method is to begin with language. In this way the pupil will see and understand the grammatical use of words, while by the old method he recited their use without understanding it. By the former method, he depends on what the book says; by the latter method, he learns to depend on his own judgment in determining the nature and relation of words. In one case, he looks at grammar through the definitions; in the other case

he looks at grammar through the nature of the subject itself In the former case, grammar is too much a matter of memory; in the latter case, it is a matter of the judgment and the understanding. Let grammar, therefore, be taught from language, as it was originally developed by those who first investigated it.

An additional reason for teaching primary grammar from language without a text-book, is that the proper study of the subject is especially an act of the judgment. There are very few things to commit to memory in elementary grammar. There are a few technical terms which are readily remembered when the pupil has the ideas which they express. What we especially need is to *examine language* and notice the relations of words; and not to commit and recite definitions. There is no other study in the public school that so little needs a text-book as the first lessons in grammar; and assuredly there is no study in which the text-book is so much of a hindrance to the beginner as this. Some of the most successful teachers of advanced classes in grammar use an edition of some of the favorite poems of our eminent authors as the text-book for the lesson, while the real text-book is used only as a work of reference.

3. *Make the sentence the basis of grammatical instruction.* Though we begin with words, we should pass as soon as possible to sentences, and study the words with respect to their relations in sentences. Grammar treats of the sentential use of words, and it is only by viewing their relations in sentences that we can understand their grammatical meaning and use. In teaching grammar, therefore, the sentence is to be regarded as the unit of reference. But though we make use of the sentence in instruction, we are to consider, first, not the logical use of the words in it, but their etymological use. The words in the sentence are to be regarded as etymological elements expressing objects, actions, etc., and not the logical elements of which sentences are composed.

4. *Make the subject practical.* We should require the pupils to *use* good grammar; to apply what they learn in moulding and correcting their own speech. We should excite an interest among pupils in the use of correct language, and in correcting their mistakes. Have them bring in false syntax heard in the school-room and on the playground. Let the teacher be careful to use correct language himself, as an example to his pupils.

5. *The course in grammar should be preceded by a course of instruction in Language Lessons.* The basis of instruction in grammar is language, and a pupil should have some lessons in language before he begins the subject of technical grammar. Such a course of lessons is indicated under the methods of teaching Composition.

Time to Begin.—The time to begin grammar depends upon the manner in which it is taught. If presented inductively, with oral exercises, the pupil may begin the study at nine or ten years of age. The average age for the pupils of our common schools is probably about ten or twelve. If, however, grammar is taught by the old method from the text-book, it should not be commenced before the age of fifteen or sixteen.

Division of Subject.—For the purpose of instruction, grammar may be divided into Primary Grammar and Advanced Grammar. For Primary Grammar, the synthetic or etymological method of teaching is employed as the basis of instruction; in Advanced Grammar the analytic or logical method should be made more prominent. We shall indicate a course of instruction in both.

II. Method of Teaching Primary Grammar.

By Primary Grammar is meant such a course of instruction in grammar as shall present the fundamental facts and principles of the science. It is designed to lay the foundation of grammatical knowledge, but does not extend to the higher philosophical principles of the science, nor discuss the anomalies of construction, etc.

Principles of Instruction.—There are several principles of instruction that should be made especially prominent in a primary course in grammar. They are principles that have been previously announced; but so important are they, and so often are they violated in grammatical instruction, that we repeat them here.

1. *Teach first the idea and then the expression of it.* This principle is of especial importance in teaching grammar. The old way was to teach the expression first, and often the pupil did not get the idea at all. Both teachers and pupils have used the expressions, "govern," "relates to," "qualifies," "modifies," etc., for years, without ever thinking what they meant. The majority of teachers of whom we have inquired, What do you mean by "prepositions govern the objective case?" could give no intelligent explanation of its meaning. Do not, therefore, begin with the definition as the statement of the idea, but present the idea first, and then lead the pupils to the expression of it.

2. *Teach pupils to discover the idea you wish to express.* The old way was to tell the pupil everything; the better way is to allow him to discover all he can for himself. This is the inductive method of instruction, and grammar is one of the very best studies in which to apply the inductive method. It will make the pupil a thinker in grammar, independent of the teacher or text-book.

3. *Let the primary aim be grammatical ideas rather than grammatical expressions.* Care not so much for the definitions as for the idea to be defined. Do not require definitions until the idea is clearly developed in the mind of the learner, and let the definition flow from the natural expression of the idea.

4. *Do not burden the memory with grammatical forms.* A general fault in teaching grammar is that the subject is made

too formal. Too much attention is paid to the manner of expressing grammatical ideas. In Primary Grammar, the forms of parsing and analysis should be very simple. We should depend more upon asking pupils questions in language than upon their giving any set forms of expression.

The Order of Instruction in this subject, in accordance with these principles, is as follows: 1. The Idea; 2. The Name; 3. The Definition; 4. Exercises.

The Course of Instruction.—The Course of Instruction in Primary Grammar includes the following things: 1. The Parts of Speech; 2. The Properties and Inflections; 3. The Classes of the Parts of Speech; 4. The Rules of Construction; 5. The Elements of Parsing; 6. The Elements of Analysis; 7. Correcting False Syntax.

These are to be presented somewhat in the order named, but not entirely so. We should begin with the Parts of Speech, but the Classes and the Inflections may be taught somewhat together; and the Elements of Parsing, Analysis, and the Correcting of False Syntax, should be introduced gradually as the pupils are prepared for them. The above is a logical division, showing what is to be taught rather than the order in which the several things are to be presented. In presenting the subject, we shall first *describe the method* of teaching, and then follow the description with an *inductive lesson*, indicating how the pupil is led to the idea and its ex pression, by appropriate questions.

I. PARTS OF SPEECH.—We begin the instruction in grammar, by teaching the Parts of Speech. In order to prepare for this, we should give to the pupil a clear idea of an *object* and a *word*. This can be done by showing them an *object*, asking its *name*, and calling attention to that which we hear spoken, or see written. The lesson suggested is as follows:

Model Lesson.—Teacher, holding up a *book*, a *knife*, etc., says, What is this? *Pupil.* A *book.* *T.* This? *P.* A *knife.* *T.* What do we call all these things we can see, touch, etc.? *P. Objects.* *T.* What do we call those things we hear when we speak? *P. Words.* *T.* Are there any words besides those we *hear?* *P.* Yes, words we can *see.* *P.* What shall we call the words we can see? *P. Seen words.* *T.* Since we *write* these words, what may we call them? *P. Written words.* *T.* What may we call the words we hear? *P. Heard words.* *T.* Since we *speak* them, what kind of words may we call them? *P. Spoken words.* *T.* How many kinds of words then have we? *P.* Two kinds; *spoken words* and *written words.*

The Noun.—To teach a *Noun*, present several objects to the pupil, have him name them, write these names on the board, and lead him to call them *object-words;* then to define an object-word, and then give him the term *noun* as meaning the same as *object-word*, and have him define a *noun.* Then give exercises, requiring him to select nouns from a book, and to give examples of nouns. Then teach that the names of persons, places, etc., begin with a capital letter.

book.
knife.
pencil.
window.

Model Lesson.—Teacher. What is this I hold in my hand? *Pupil.* A book. *T.* What is this? *P.* A knife. *T.* This? *P.* A pencil *T.* I will write these names on the board; what are these in my hands? *P.* Objects. *T.* What are these on the board? *P.* Words. *T.* What are these words the names of? *P.* The names of objects. *T.* Since they are the names of objects, what kind of words may we call them? *P. Object-words.* *T.* What then is an *object-word?* *P. An object-word is the name of an object.*

They have thus been led to the idea of an object-word, to name it themselves, and to make their own definition of it. The next step is to require them to *name* and *write* object-words, and to have them point out object-words in the reader. After they are familiar with object-words, then introduce the name *noun.* The exercise is as follows:

Model Lesson.—Teacher. What do we call the names of objects? *Pupil. Object-words.* *T.* I will give you a shorter word that means the same as *object-word;* it is *noun;* what is it? *P. Noun.* *T.* What then is a *noun?* *P.* A noun is an *object-word.* *T.* And what is an object-word? *P.* An object-word is the name of an object. *T.* What then is a *noun?* *P. A noun is the name of an object.*

The Verb.—To teach the *Verb*, we call the pupil's attention to the *actions* of some object, write a list of words expressing action upon the board, lead the pupils to call them *action-words*, and define an *action-word*, and then, after they are familiar with the idea and name, introduce the term *verb* as meaning the same as *action-word*, and lead them to define it, and give them a drill on the verb and the noun.

Model Lesson.—Teacher. Name some of the actions of a child. *Pupil.* A child *runs, plays, sings, eats, drinks, sleeps,* etc. *T.* Very well, I will write these on the board in a column; what are these words the names of? *P.* The names of *actions.* *T.* If they were the names of *objects,* what should we call them? *P.* Object-words. *T.* Since they are the names of *actions,* what may we call them? *P. Action-words.* *T.* What then is an *action-word?* *P.* An action-word is the name of an action. *T.* Very well; there is a little word that means the same as *action-word;* it is *verb;* what is it? *P. Verb.* *T.* What then is a verb? *P.* A verb is an *action-word.* *T.* And what is an *action-word?* *P.* The name of an action. *T.* How then may we define a *verb?* *P. A verb is the name of an action;* or, *A verb is a word that expresses action.*

Child	*runs.* *plays.* *sings.* *eats.* *drinks.* *strikes.*

Exercises. —1. Name actions of different objects. 2. Name objects that can do different actions. 3. Select nouns and verbs in the reader.

The verb may also be taught as a *doing-word* instead of an *action-word*, by asking what a child can *do.* After the pupils are familiar with the primary use of the verb as *expressing an action*, they should be led to see that the verb may be used in *making a statement, asking a question*, or *giving a command;* from which an accurate definition may be obtained.

The Sentence.—We should next unite the noun and verb into sentences, and give the pupil an idea of the sentence. Then teach the three kinds of sentences,—the *telling* or *declarative* sentence, the *asking* or *interrogative* sentence, and the *commanding* or *imperative* sentence. Then teach them to write sentences, observing these three rules: 1. A sentence begins with a capital letter; 2. A declarative or an imperative sentence ends with a period; 3. An interrogative sentence ends with an interrogation point. The sentence may also be presented before the verb, and the nature of the verb taught from the sentence.

Model Lesson.—Teacher, writing the word *John* on the board, asks what he has written on the board. *Pupil.* The word *John.* *T.* Tell me something *John* does. *P. John walks, John talks, John sings,* etc. *T.*, writing them on the board, says, Such expressions as these, containing a noun and a verb, in which the verb names some action of the noun, are called *sentences.* Make some sentences about Mary, a bird, a horse, etc. *T.* What might a sentence which *tells* something, be called? *P.* A *telling sentence.* *T.*, writing, *Can John walk?* says, Does this tell anything about John? *P.* No, sir, it asks a question. *T.* Very well, such a combination of a noun and a verb is also called a *sentence.* Since it *asks* a question, what kind of a sentence may we call it? *P.* An *asking sentence.* *T.*, writing, *John, walk fast,* may by similar questions, lead the pupils to call it a *commanding sentence.*

The Adjective.—In teaching the *Adjective*, we first lead to the idea of *quality.* We do this by comparing objects, and having pupils name the differences, and telling them these are called the *qualities* of the objects. We then get a list of the qualities of an object, and then lead the pupils to call the words *quality-words*, or *quality-object-words*, and define the same; we then introduce the term *adjective*, and have them define it. Before giving the word adjective it may be well to lead pupils to call them *adnouns*, since they are added to nouns.

Model Lesson.—Teacher, holding up two objects, as a *pencil* and *card,* What have I in my hands? *Pupils. Pencil* and *card.* *T.* Do they look alike? *P.* No, sir. *T.* How do they differ? *P.* One is *round,* the other is *flat;* one is *black,* the other is *white;* etc. *T.* Very well; these things in which objects differ are called *qualities* of objects; what are they called? *P. Qualities* of objects. *T.* Name some qualities of an apple. *P. Sweet, sour, red, yellow, mellow, ripe,* etc. *T.* We will write these in a column on the board; now what are these words the names of? *P. Qualities* of objects. *T.* If they were the names of objects, what kind of words should we call them? *P* Object-words. *T.* Since they are the names of qualities, what shall we call them? *P. Quality-words.* *T.* Since they belong to objects, what kind of quality words may we call them? *P. Quality-object-words.* *T.* What then is a *quality-object-word?* *P.* A quality-object-word is the name of a *quality* of an object. *T.* There is another word which means the same as *quality-object*

sweet.
sour.
red.
yellow.
mellow.

word; it is *adjective*; what is it? *P. Adjective.* *T.* What, then, is an *adjective*? *P.* An *adjective* is a *quality-object-word.* *T.* And what is a *quality-object-word?* *P.* The name of a quality of an object. *T.* What then is an *adjective?* *P. An adjective is the name of a quality of an object.* Show also how to lead the pupil to call them *adnouns.*

Exercises.—1. Name the qualities of objects; 2. Name objects having certain qualities; 3. Write sentences containing given *nouns, verbs,* and *adjectives*; 4. Point out nouns, verbs, and adjectives in the reading book.

The Adverb.—We taught the Adjective by *comparing objects;* we should teach the *Adverb* by *comparing actions*, since the *adverb* bears the same relation to *actions* that the *adjective* does to *objects.* We begin by comparing actions, obtain a number of words which distinguish them, write these words upon the board, and lead the pupil to call them *quality-action-words*, and define the same; and then introduce the term *adverb* by showing that the quality-action-word is *added to a verb*, and lead them to define it.

Model Lesson.—Teacher, moving his hand, inquires, What am I doing? *Pupil* Moving your hand. *T.* Look and see if these motions are alike: how does it move now? *P. Slowly.* *T.* How does it move now? *P. Fast,* or *quickly.* *T.* How does it move now? *P. Upward.* *T.* How does it move now? *P. Downward.* *T.* Are these motions alike? *P.* No, sir. *T.* What words distinguish these actions? *P. Slowly, quickly, upward, downward.* *T.* What did we call those things in which objects differed? *P.* Qualities of objects. *T* What shall we call those things in which actions differ? *P. Qualities of actions.* *T.* What shall we call those words that name the qualities of actions? *P. Quality-action-words.* *T.* What then is a *quality-action-word?* etc., etc. To lead to the term *adverb* write "hand moves slowly" on the board. *T.* What is slowly? *T.* To what word is slowly *added, hand* or *moves?* What part of speech is moves? To what part of speech then is slowly *added?* If it is added to a verb, what may we call it? *P. Added to a verb?* *T.* Yes, or *adverb;* what then is an adverb? etc.

slowly.
quickly.
upward.
downward.

In this way the adverb is first taught as a word which distinguishes *actions.* After the pupil is entirely familiar with this idea, the use of the adverb as *distinguishing* the *qualities of objects* should be presented. This may be done by *com-*

paring two qualities, as we did *actions*, and thus obtaining a list of words which distinguish qualities. The pupil is then to be told that these words are also called adverbs. Let the student-teacher give an exercise from the description.

After this idea is clearly in the mind, the office of the ad verb as distinguishing between the *qualities of actions*, or as limiting an adverb, should be taught. This is done by comparing the *qualities of actions*, thus the quality *slowly* may be compared, giving us *very* slowly, *rather* slowly, *more* slowly, etc., and getting a list of words which distinguish qualities of actions, and telling the pupil that these are also called *adverbs*. The manner of forming adverbs from adjectives by adding *like* or its contraction *ly*, thus, *sweet-like*, *sweetly*, etc., may also be shown. Let the student-teacher give the lesson.

In this way the adverb, in its three-fold use, may be understandingly taught. With the more advanced pupils, the question may be raised, why the same part of speech, the adverb, should have been used to perform these three offices, namely, to distinguish *actions*, *qualities of objects*, and *qualities of actions;* and why we should not have another part of speech to distinguish *qualities* of objects and actions.

Another way of teaching the adverb recommended by some teachers, is to show that it expresses *how*, *when*, and *where*, and introduce it as a *how*, *when*, or *where word;* but the method already explained is preferred, because it shows the real nature and office of the word, which the other does not.

The Pronoun.—We teach the *Pronoun* by showing the pupil that words are used *for nouns*. We get a list of such words on the board, drawn from actual use in language, and lead the pupils to call them *for-nouns*, and define a *for-noun*, as *a word used for a noun*. Then tell them that there is a word, *pro*, derived from an old language, which means the same as *for*, and lead them to substitute it for the word *for*, getting the word *pronoun;* and then lead them to define a *pronoun;* and continue the exercises on the parts of speech.

Model Lesson.—Teacher, writing on the board the sentence, "Give John John's book," says, How else may this be expressed? *Pupil.* Give John *his* book. *T.* How may "Give Mary Mary's book," be otherwise expressed? *P.* Give Mary *her* book. *T.* For what word do we use *his?* *P.* For John. *T.* What part of speech is John? *P.* A noun. *T.* For what then do we use *his?* *P.* For a noun. *T.* What may we call words which we use for nouns? *P. For-nouns.* *T.* What then is a *for-noun?* *P.* A *for-noun* is a word used for a noun. *T.* If we use the word *pro,* which means *for,* in place of for, what will *for-noun* become? *P. Pronoun.* *T.* What then is a *pronoun?* *P. A pronoun is a word used for a noun,* etc. Keep up the review in exercises as before.

The Conjunction.—The *Conjunction* may be taught by leading pupils to see its use in joining words, and then leading them to its name as a *conjoining-word*, from which they can be led to the term *conjunction.* Then lead to the definition and give an exercise on all the parts of speech, as previously indicated. For these exercises, let it be remembered, we should use language spoken by the teacher, or written upon the board, or found in the primary reader.

Model Lesson.—Teacher, writing on the board, "John can read; John can write"—, asks, How else can this be expressed? *Pupil.* John can read and write. *T.* What word is used to join *read* and *write?* *P.* The word *and.* *T.* What kind of a word may it be called? *P.* A *joining-word.* *T.* Yes, or a *conjoining-word.* *T.* What then is a *conjoining-word?* *P.* A *conjoining-word* is a word that joins or unites other words. *T.* If the word *conjunction* is used for *conjoining-word*, what is a conjunction? etc. In a similar manner we may show that the conjunction also unites sentences.

The Preposition.—To teach the *Preposition*, we show the pupil that some words express the *relation* of objects, and that such words may be called *relation-words;* then lead to a definition of *relation-words;* then introduce the term *preposition* in place of *relation-word*, and lead to a definition of *preposition*, and continue the exercises as before. In this exercise, the term *relation*, which is new to the pupil, is best explained by *using* it in the lesson.

Model Lesson.—Teacher. Standing by a table and having a book in his hand, What object is this? *Pupil.* A *table.* *T.* What object is this? *P*

A *book*. *T.*, placing the book on the table, Where is the book now? *P.* *On* the table. *T.* Where is the book now? *P. Under* the table. *T.* Where is the book now? *P Over* the table, etc. *T.* Placing the book on the table again, What little word shows the *relation* of the book to the table now? *P. On.* *T.* What little word shows the relation of the book to the table now? *P. Under;* etc. *T.* Here we have a list of words which do what? *P.* Show the *relation of objects*. *T.* What shall we call these words that show the *relation* of objects? *P. Relation-words.* *T.* What then is a *relation-word?* etc. *T.* The word *preposition* is used for *relation-word;* what then is a *preposition?* etc.

on.
under.
over.
above.
beside.

The Interjection.—The *Interjection* should be taught as a *feeling-* or *emotion-word*. Ask what words we sometimes use when we feel very sad, or very glad, or when feeling surprised, etc., and get a list of words like *oh*, *ah*, *alas*, *hurrah*, *pshaw*, etc. Then, since these express feelings or emotions, they may be called *feeling-* or *emotion-words*. Then lead to the definition, etc. At last lead to the idea that they are *interjected*, or thrown in between other words, and may be called *interjections*, and lead to the definition; and then drill them on exercises on all the parts of speech, similar to the manner previously suggested.

II. Properties of Parts of Speech.—By the *Properties* of the parts of speech are meant those things which belong to or are peculiar to the different parts of speech. They include the Number, Person, Gender, and Case of nouns and pronouns; the Number, Person, Mood, Tense and Voice of verbs; and the Comparison of adjectives and adverbs. These properties are also called Inflections, because there is a *bending* or *change* of the word from its original form or meaning.

Idea of Property.—The first thing to teach under Properties, is to lead a pupil to a clear idea of what is meant by a property of a part of speech. Nine-tenths of the pupils in grammar who use the term *property*, never stop to think what it means. To present the idea of *property*, take two objects, as a *pencil* and *card*, call attention to their qualities, lead to the idea that these qualities *belong* to the objects, lead them to tell you that that which *belongs* to any person is his *property*, and hence those things which belong to words and distinguish them are called *properties* of those words.

Model Lesson.—Teacher. What are these objects? *Pupil.* A *pencil* and *card.* *T.* Name some of their *qualities.* *T.* To which object does the quality *white* belong; to which object does the quality *black* belong? *T.* The things which belong to your father—his farm, horse, etc.—are called his what? *P.* His *property.* *T.* What then may we call those things that belong to objects? *P.* The *properties* of objects. *T.* What may we call the things which belong to words? *P.* The *properties of words.* *T.* What then is a property of a part of speech? etc.

We can teach the meaning of an *inflection* by taking a word like *abbot,* which expresses a man, and show that it changes to *abbess* to express a woman; that *box* changes to *boxes* to express the plural; etc. Then lead them to see that such *changes* or *bendings* of words to express a change of thought, are called *bendings* or *inflections.* Let the student-teacher show the method by a lesson.

PROPERTIES OF NOUNS AND PRONOUNS.—We shall first consider the properties of Nouns and Pronouns, including Number, Person, Gender, and Case.

Number.—To teach *Number*, we lead the pupil to see that words have one form for *one* thing and another form for *more than one* thing; and then since *one*, *two*, *three*, etc., are *numbers*, this property of nouns may appropriately be called the *Number* of nouns; and the pupils may be led to define it. We then lead them to see that there are only *two numbers*, since there are only *two forms*, one form for one thing and another form for more than one thing. We may then lead them to call one *single number* and the other *many number*, from which we pass to *singular* and *plural.*

We may then lead to the Rule for number, by leading them to see that we sometimes add an *s* to the singular and sometimes *es*, and sometimes change the form of the word, in forming the plural.

Model Lesson.—Teacher. What have I in my hand? *Pupil.* A book. *T.* How many books? *P. One* book. *T.* How many have I now? *P.*

Two books. *T.* How many now? *P. Three* books. The teacher will then write on the board, "I have one book," "I have two books," "I have three books," etc. *T.* Which is the noun in these sentences? *T.* How many *forms* has it? *P.* Two forms, *book* and *books*. *T.* What is its form for *one* thing? *T.* What is its form for *more than one* thing? *T.* We have then discovered this property of a noun,—that it has *one form* for *one thing* and *another form* for *more than one* thing—let us see now what we shall call this property. *T.* What are *one, two, three,* etc., in arithmetic. *P. Numbers. T.* What might we call this property of a noun by which it has one form for one thing and another form for more than one thing? *P.* The *number* of a noun. *T.* What then is the *number* of a noun? *P. Number* is that property of a noun by which it has one form for one thing and another form for more than one thing, *T.* Let us now see how many numbers nouns have. *T.* How many forms has the noun *book? P. Two* forms. *T.* How many numbers then are there? *P.* Two numbers. *T.* If there were three forms, one form for one thing, another foim for two things, and another form for more than two things, how many numbers would there be? *P.* Three numbers.

T. Let us see now what we shall call these two numbers. *T.* When a horse is hitched up alone, what kind of a harness do you use? *P.* A *single* harness. *T.* When there is one thing alone, then what may you call it? *P.* A *single* thing. *T.* What may we then call this number of a word which represents a single thing? *P. Single number. T.* Very well; that is right; now let us see what we shall call the other number. *T.* When a boy has a "whole lot" of marbles, he would say he had a great —— what marbles? *P.* A great *many* marbles. *T.* More than one thing then may be called what? *P. Many* things. *T.* This number, then, that means more than one, may be called what number? *P. Many number. T.* What are the two numbers then? *P. Single number* and *many number*. The pupils may then be led to define each, and subsequently the words *singular* and *plural* may be introduced.

They may then be led to see that in words like *book* we add *s* to form the plural, and state it as a rule. They may then be led to see that in other words, as in *box*, we add *es* to form the plural, and state it as a rule. They may then be led to see that we sometimes change the form of the word to form the plural, as *man, men, ox, oxen*, etc. The pupils should then be drilled on forming plurals; and also *make a list of the personal pronouns* classed with respect to number, as these will be needed in some of the exercises which follow.

Taught in this way, the pupils will see that though there are *many* numbers in arithmetic, there are only *two* numbers in grammar, since there are only *two forms* of words to distinguish the number of objects. They can be told that in some languages, as the Greek, there is one form for a single thing, another form for two things, and another form for more than two things, giving *three numbers* in grammar—the *singular*, the *dual*, and the *plural*.

Person.—To teach *Person*, we first lead the pupils to see that a noun may represent three distinct persons—the *person speaking*, the *person spoken to*, and the *person spoken of*. We then lead them to call this property of nouns *person;* then lead them to a definition of the person as that property of a noun by which it represents the person speaking, the person spoken to, and the person spoken of. We then lead them to see that there are three grammatical persons, and that they are appropriately distinguished as first person, second person, and third person. To do this, we lead them to see that the *first* thing necessary for something to be said is a *person speaking*, the *second* condition is some one to *speak to*, and the *third* condition is some one or something to *speak of;* hence the name of the speaker may be called the *first person*, the name of the person spoken to, the *second person*, and the name of the person or thing spoken of, the *third person*.

The pupils should then be required to point out the person of nouns and pronouns, use nouns and pronouns of a given person in constructing sentences, and be drilled on exercises similar to those already suggested. They should also be required to make a list of pronouns arranged according to *person*.

Let the student of this book be required to translate the above description into an inductive lesson, such as is given under the previous subjects. The following three sentences may be used in giving the lesson: "I, John, am here;" "John, come here:" "John is here."

Case.—The subject of *Case* is regarded as very difficult for young pupils; but, if properly presented, it is quite readily understood. We should first teach the nominative and objective cases together, then the possessive case, and then the objective case after the preposition. We shall describe the lesson briefly.

The teacher will write on the board, *John strikes William*, call attention to the action, ask who does the action, who receives the action, then ask if they both bear the same *relation* to the action; what *relation* John bears to the action, having them say he is the *doer* of it; what *relation* William sustains to the action, leading them to say the *object* of the action; then tell them that this property of words sustaining different relations to an action is called *Case*, and lead them to define *case;* then lead them to call John the *doer case* and William the *object case*, and define each; after which he can introduce the terms *nominative* and *objective*.

The *possessive* case can be easily taught by the relation of ownership or possession. The next step is to lead to the different case forms of the personal pronouns. A list of these should be made, classed according to case; and the pupil be drilled on them until he knows them by sight, independently of their relation in the sentence.

The next step is to teach the objective case after the preposition. This needs especial notice, as it is not at all apparent to the learner that in the sentence, "He gave it to John," John is in the objective case. Indeed, if the teacher should take the two sentences, "John has the book," and "I gave the book to John," and ask what case is John in the first sentence, and then what case is John in the second sentence, the pupils would say *nominative* in both. This shows that it is not evident to a beginner that prepositions require the objective case. We should, therefore. teach the objective case after a preposition by the use of the pronoun. Let the pupil see that in the sentence, "I gave the book to John," we cannot say "to *he*," nor "to *his*," but are required to say, "to *him*," which is the objective form; hence John, which is represented by *him*, must be in the objective case. Let the pupil then be drilled on case by pointing out the case of words in sentences, constructing sentences with given cases, etc., as before suggested. The student-teacher should be required to present this description in an inductive lesson, like those previously given.

Gender.—Gender is easily taught. We first call attention to the difference of *sex* in animals, and the absence of sex in other objects. We then show that some words change their form to express males and females, which property is called the *gender* of nouns and pronouns. Then lead them to define gender, to see that there are *two* genders, since there are two sexes, and lead them to name and define each. Then lead them to see that the words which apply to objects that are *neither* male nor female, are said to be in the *neuter gender;* and also that those words which are *common* to both males and females may be said to be in the *common gender.* The main point of difficulty is to distinguish *sex*, which is the attribute of objects, from *gender*, which is a property of words. Give abundant exercises as before suggested. The student-teacher may be required to give the lesson like the models presented.

PROPERTIES OF THE VERB.—We shall now show how to teach the properties of the Verb to beginners in grammar. These properties are Number, Person, Mode, Tense, and Voice. The properties of Number and Person are derived properties, properties which the verb acquires from its subject. The other properties are intrinsic, belonging to the verb *per se*.

Mode of Verbs.—To teach *Mode*, write on the board, "John studies his lesson," "John, study your lesson," and "John can study his lesson." Ask which sentence *declares* the action, which *commands* it, which expresses its *possibility*, then ask which part of speech expresses these three things.

Ask in what *manner* the verb expresses the act in the first sentence; have them say it simply *declares* the act. Ask in what *manner* the verb expresses the act in the second sentence; requiring them to say it *commands* the act; etc. We thus discover the property that a verb may express an action in different manners; then inquire what we may call this property of the verb, and have them call it the *manner* of the verb. What then is the *manner* of a verb? If we use the word *Mode*, which means the same as *manner*, what shall we call this property of the verb? *Ans.* The *Mode* of the verb. What then is the mode of a verb? etc.

The next point is to *name* the modes. In how many ways did we express the action? How many modes then are there? The first simply *declares* or *indicates* the act, what mode then may we call it? *Ans.* The *declaring* or *indicating mode.* From this we lead to the *declarative* or *indicative* mode. The second *commands* the act; lead pupils to call it the *commanding mode*, and then give them the term *imperative.* The third expresses the *possibility* of the act; lead them to call it the *possible mode*, and then give them the term *pctential*, as meaning the same thing.

The *subjunctive* mode is so nearly obsolete that it need not be taught; and the *infinitive* may be taught by its form; or, what is better, be called *an infinitive*, and not regarded as a mode of the verb. The *participle* may be taught in the same manner. The student-teacher should be required to present the method of teaching *mode* in an inductive lesson.

Tense of Verbs.—To teach *Tense* we first call attention to the kinds of time—*present*, *past*, and *future.* We then write on the board—"John studies grammar," "John studied grammar," "John will study grammar;" and ask what time is expressed by each form of the verb, and thus discover that the verb can express the act as *present*, *past*, or *future.* We then call attention to this property of a verb by which it expresses different kinds of *time*, and lead the pupils to call it the *time* of the verb. We then introduce the word *tense*, meaning the same as time; lead them to call the property the *tense* of the verb, and then lead them to define tense. We then lead them to call the first, *present tense*, the second, *past tense*, and the third, *future tense*, and require them to define each.

The other tenses may also be easily taught. Show them that *have studied*, since it denotes the act as *completed* or *perfected*, may be called the *completed* or *perfect tense;* and since it expresses an action having a relation to the present time, it may be called the *present perfect tense.* Also that *had studied*, since it denotes an act completed at some past time, may be called the *past perfect tense.* Also that *shall* or *will have studied*, since it denotes an act completed at some future time, may be called the *future perfect tense.* The tenses of the potential mode may be taught arbitrarily by their forms, since they do not express the distinctions of time as named. The student teacher will put the above in an inductive lesson.

Number of the Verb.—The *Number* of verbs should be taught with reference to the number of their subjects, as the verb of itself has no number. It is a property derived from its subject, and should so be presented to the learner.

To teach the number of verbs, write a sentence on the board, as "He reads the Bible," and under it "They read the Bible," and ask what change there is in the verb, and the reason for this change. Let the pupils see that the *change in the number of the subject causes a change in the form of the verb.* They thus discover a property, that the verb changes its form when the subject changes its number; and they may be led to call this property the *number of the verb.* Then lead them to define the number of a verb.

Drill the class on the singular and plural forms; have them point out the forms in sentences, construct sentences with given numbers, correct mistakes heard in conversation with respect to the number of the verb, etc. Require them also to derive and state the rule of the agreement of the verb with its subject in number.

Person of Verbs.—The *Person* of the verb should be taught with reference to the person of its subject, as the verb in itself has no person, but derives it from its subject.

To teach the person of verbs, write on the board, "He reads a book," and under it, "I read a book," and call attention to the change in the form of the verb. Then lead them to see that the subject has changed, not its number or gender, but its person; and that we have thus discovered a property of a verb, that *it changes its form as its subject changes its person;* and that this property may appropriately be called *the person of the verb.* Then lead them to define the person of a verb as *that property by which it changes its form as its subject changes its person.* Then drill the pupils on person, as previously suggested.

Voice of Verbs.—The Property of Voice, if it be taught at all, may be presented as follows: Write on the board, "John strikes William," and "William is struck by John." Lead the pupils to see that in the first sentence the verb expresses the *subject as acting*, and in the second it represents the *subject as receiving the act.* We thus discover a property of a verb, that it may *represent its subject as acting or being acted upon.* This property needs a name; what shall we call it? Call their attention to the fact that we express things with the *voice*, and that since the *voice* is a *way* of expressing things, this property of verbs by which they express the act in *different ways* may be called *voice.*

Then lead to the name of the two kinds of voice. Since the first expresses the subject as *active*, it may be called the *active voice.* Since the second expresses the subject as receiving the action, it may be called the *receiving voice;* or, since the word *passive* means just the opposite of active, and the verb expresses its subject as not active, but *passive*, this second kind of voice may be called the *passive voice.*

Comparison.—The Comparison of adjectives and adverbs is very easily taught, and we will not take space to present the subject here. Any teacher who has become thoroughly imbued with the spirit of the concrete and inductive form of instruction used in the previous exercises, will have no trouble in presenting the subject, if he understands it himself.

III. CLASSES OF PARTS OF SPEECH.—The Classes of the Parts of Speech should next be presented. It might be thought that these should have preceded the Properties, but in several cases we need a knowledge of the properties in order to make the distinction of classes. In actual instruction, they should be, to a certain extent, combined, which is left to the judgment of the teacher. It is more convenient to consider them separately in this work. Under each head we will describe the method of instruction, but the student-teacher should be required to present it in the form of an inductive lesson. The author of this work does not consider his pupils as prepared to teach any part of grammar until they can present an inductive lesson, showing just how they would proceed in their instruction.

Classes of Nouns.—The teacher, by appropriate examples and questions, will lead the pupil to see that some nouns apply to *particular persons* and *things;* as, John, Mary, Boston, Washington, etc. Each of these objects has its *particular* or *proper* name; and hence such nouns may be called *proper nouns.*

Lead the pupil to see also that many similar objects have a name *in common;* that the term *horse*, for instance, does not distinguish any particular horse, but is a term *common to all horses;* and that it may therefore be called a *common noun.* Lead them in the same way, when it is desirable, to the *abstract* and *collective* noun, and also to the classification in respect to form,—Simple, Derivative, and Compound.

Classes of Verbs.—Verbs may be classified in two ways: 1. With respect to their *object*, as *Transitive* and *Intransitive;*

2. With respect to their *form*, as *Regular* and *Irregular*. The old classification into *active*, *passive*, and *neuter*, is being discarded by modern grammarians. It might be well to retain the term *neuter* for the verb *to be*, and regard other verbs as *active* and *passive*, instead of distinguishing them by *voice*. The *passive verb* seems a little simpler to the learner than the *passive voice* of the transitive verb. All active verbs do not express action, neither do verbs in the active voice.

Transitive and Intransitive.—To teach the distinction of *transitive* and *intransitive*, lead the pupil to see, by examples and questions, that sometimes the action of the verb *passes over* to an object, and sometimes it does not; and that there are thus *two kinds* of verbs. Next lead them to see that the verb in which the action *passes over* or makes a *transition* to the object may be called a *transition* or *transitive* verb, and that the others may be called *intransitive*. Then drill them on transitive and intransitive verbs, as found in sentences, and also in constructing sentences.

Pupils should also be led to see that this distinction of transitive and intransitive is not an absolute one, but that many verbs are used in both ways. Indeed, there is hardly a transitive verb in the language that may not be used intransitively.

Regular and Irregular.—To teach the distinction between *regular* and *irregular* verbs, lead the pupil to see that some verbs form the past tense by adding *ed*, and others have *no regular way* of forming it, and that those which form it *regularly* may be called *regular verbs*, and that those which form it *irregularly* may be called *irregular verbs*.

Pupils should then be drilled on the regular and irregular verbs. A list of the irregular verbs should be presented and carefully studied until the pupil is familiar with their proper forms. Sentences should be constructed requiring the use of the verb; and sentences erroneous in this respect, corrected. Verbs in the use of which there are frequent errors, as *lay*, *lie*, *sit*, *sat*, *prove*, *drink*, etc., should be carefully considered.

Infinitives.—There are two forms derived from the verb, usually called the *infinitive mode* and the *participle*, to which attention is briefly called. These may be taught by *the form*, arbitrarily giving them the names applied to them; or they may be taught by their use and meaning. The pupil may be led to see that the participle *participates* in the nature of a verb and adjective, and is thus appropriately called a *participle*. It may also be shown that the infinitive, as *to go*, having no nominative, is *unlimited* by person and number, and is thus *indefinite* in this respect, and may consequently be called an *infinitive*, which means unlimited. It may also be shown that the participle is also unlimited in person and number, and is thus also an *infinitive;* and that consequently there are two infinitives, the *verb infinitive* and the *participle infinitive*. The pupil should also be led to see that there are two participles, the *present* and the *past* or *passive*.

Classes of Pronouns.—Pronouns may be divided into five distinct classes; Personal, Relative, Interrogative, Responsive, and Adjective. Authors are not fully agreed in this matter, but the classification given is convenient and as correct as any we have noticed.

Personal Pronouns.—In teaching Personal Pronouns, the teacher will lead the pupil to see that each one of these indicates by its form whether it is first, second, or third *person*, and may for this reason be appropriately called *personal pronouns*. A list of these should then be given, and the pupil may be required to commit them to memory. The student-teacher may present an inductive lesson on the subject.

Relative Pronouns.—A Relative Pronoun may be taught in two ways; etymologically or logically. By the first method, we would show that it is a *pronoun*, because it stands for a noun; and that it is a *relative* pronoun, because it *refers back* or *relates* to some noun already named. The personal pronoun can be used independently of the noun; but the relative pronoun is always used in *relation* to a given noun.

By the logical method we would teach that it is a *pronoun* as before; and then lead the pupil to see that it is a *relative* pronoun, because it *connects* or *relates* the clause which it introduces to some previous word or clause. It will be well for the student-teacher to put both methods into an inductive lesson. The other classes of pronouns may also be easily taught in a similar manner.

IV. Elements of Parsing.—The pupil should begin to parse as soon as he begins grammar. As he learns each part of speech, he should be required to point it out in sentences. When he has learned some of the properties, he should also be required to give them in connection with the parts of speech. This is the kind of parsing that should be required in the Primary Course. It should be informal, and often consist merely of the answering of questions which the teacher may ask on the parts of speech and their properties. There should be no formal parsing, that is, no models should be followed which burden the memory with details. The main object should be to teach grammatical ideas and relations, and not grammatical forms of expression. To introduce these forms of parsing too early, is to burden the mind with forms, and thus prevent it from looking at the grammatical relations of words.

V. Elements of Analysis.—In this Primary Course, there should also be some instruction in the elements of grammatical analysis. This instruction should be presented as a generalization of the offices of the parts of speech. Pupils should first be led to understand the *subject* and *predicate* of the sentence. This may be done by showing that the verb, which primarily was regarded as expressing action, is used in expressing an *assertion*, that the word in the nominative case is the *subject* of this assertion, and may be called the *subject* of the sentence, and that what is asserted is the *predicate*. It may then be shown that a collection of words may be used as the subject, and a collection of words as the predicate

We should pass next to the subordinate elements of the sentence. The pupil may be led to see that the adjectives which originally were regarded as expressing qualities, *mark out* or *limit the meaning* of nouns, and may be called limiting words. We should then pass from a single *word* as limiting a noun to see that a *phrase* and a *clause* may be used in the same manner, and may then also be regarded as limiting elements. In the same way the pupil may be led to see that the phrase and clause may also perform the office of an adverb, etc.

The aim of this instruction is to teach the ideas of analysis, and lead the pupils to see and understand these logical relations; but no formal analysis should be required of them. They may be required to answer questions and point out elements; but they should not be required to commit and follow any set forms of statement, as is properly required of advanced pupils in grammar.

VI. False Syntax.—Simple examples in False Syntax should be made use of from the beginning. Common errors in language should be presented, their faults pointed out and corrected. Mistakes heard on the playground should be brought in and corrected. Pupils should be encouraged to watch their own language and to endeavor to correct all their mistakes. No formal methods of correction should be required, however, as would be appropriate for an advanced class.

VII. The Logical Method.—After the pupil has attained a fair knowledge of the parts of speech, their properties, classification, etc., with the elements of parsing and analysis, he is prepared to look at the subject of grammar from the standpoint of thought; and we should then introduce the elements of analysis by what we have distinguished as the Logical Method of teaching grammar.

In the Logical Method of teaching grammar, the sentence is made the basis of the instruction; the method beginning with the logical analysis of the sentence. This logical analysis.

instead of being built up by a generalization from the use of words, flows from the sentence as expressing a thought, and descends from the various elements as wholes to the parts of which they are composed. The pupil is taught to look at a sentence as a logical whole, and to study the logical elements of which it is made up. Language is regarded as the expression of thought, and the structure of language is determined by the laws of thought.

The principles of Logic are thus to be made use of in determining the principles of language. Words are to be considered not merely in their individual meaning, but as expressing, individually and collectively, the logical relations of the elements of thought.

The subject and predicate are regarded as expressing conceptions of the mind, the one being compared with the other, and the sentence expressing the relation between them. In this they differ from nouns and verbs, which are usually regarded not as expressing the mental product, but as the names of objects and actions. The subordinate elements are regarded as modifying elements, limiting the meaning or extent of the subject and predicate conceptions. In this they differ from the adjective and adverb etymologically considered, which express qualities of objects and actions. The connective elements are those which unite the other elements into a unity of structure.

Method of Teaching.—In teaching by the logical method, we should begin by giving pupils a clear notion of an *idea* and a *thought*, and also of a *sentence*, as expressing a thought. We should then lead them to see that some ideas are *particular* and others are *general*, and that these general ideas embrace many individuals. We should then lead them to see how these general ideas are limited in their extent by other elements which, in comparison with the principal elements, may be called *subordinate elements*. We should then teach them to see the different classes of subordinate elements, etc

An Idea.—We may lead pupils to a knowledge of an *Idea* by having them look at an object, then think of the object when not looking at it, noticing the product in the mind, and telling them that this mental product is called an *idea.* The exercise we suggest is as follows:

Model Lesson.—Teacher. Look at this book. Can you think of this book when you do not see it? Can you imagine you see this book when your eyes are closed? Do you seem to have a picture of it in your mind? Such a mental picture is called an *Idea.* What then is the difference between an *object* and an *idea?* Is the *object* in the mind? Is the *idea* in the mind? Where is the object? *Pupil.* Outside the mind. *T.* Where is the idea? *P.* Within the mind. Let there be a drill also to show that there are *general* ideas and terms, and to show the difference between general and particular ideas and names.

A Thought.—In order to teach a *Thought*, have the pupils form two ideas, compare them, and think the relation between them. This mental product, in which one idea is affirmed of another, is called a *thought.* The lesson is somewhat as follows:

Model Lesson.—Teacher. Think of something, as a *robin;* the mental product is what? *Pupil.* An *idea.* *T.* Think of something else, as a *bird;* the mental product is what? *P.* An *idea.* *T.* Can you think of any relation between these ideas? can you unite them in any way? *P.* Yes, sir,—a *robin* is a *bird.* *T.* This mental product is called a *thought.* A thought is the relation of two ideas in such a way that one is asserted of the other. *T.* Compare the two ideas, *a horse,* and *an animal,* and affirm the one of the other. *P.* A *horse* is an *animal.* *T.* This is also a thought. What is the difference between an *idea* and a *thought?* How many ideas are necessary to a thought?

The Sentence.—In teaching a sentence, we merely show that it is the expression of the thought, either in oral or written words. Take one idea or object of thought, and affirm some other idea or object of thought of the former; write the expression on the board; this will be a sentence. Be careful that the pupil sees that such combinations as *sweet apples*, etc., are not sentences. Teach also the different kinds of sentences. The student-teacher may give the lesson.

Subject and Predicate.—To teach the Subject and Predicate, take a sentence, call attention to the two parts, showing that one is the name of that about which something is asserted, and the other is the name of that which is asserted; lead them to call the first the *subject*, from the *subject* of a composition; and the latter *predicate*, because the teacher says that is its name.

Model Lesson.—Teacher. In the sentence, *Boys run,* how many parts are there? Which is the part about which something is said? Which is the part that tells what is said of *boys?* Let us see what we shall call these parts. When you write a composition, what do you call that about which you write? *Pupil.* The *Subject* of the composition. *T.* Very well; what shall we call *boys*, about which something is said in the sentence, *boys run?* *P.* The *subject* of the sentence. *T.* What then is the subject of a sentence? The word *runs* does what? *P.* Tells or asserts something of boys. *T.* What may it be called? *P.* The *telling* or *asserting* word. *T.* Well, suppose *predicate* means the same as *asserting word,* what shall we call *runs?* *P.* The *predicate,* etc.

Subordinate Elements.—The Subordinate Elements may be taught somewhat as follows: Take a sentence like the following; "Many bright flowers fade quickly," and have them show what words can be omitted and still have a sentence; and lead them to call the necessary words, *flowers* and *fade*, being more important than the others, the *principal elements.* The words *many*, *bright*, and *quickly*, being less important, are subordinate in rank, and may be called *subordinate elements.* Let the student-teacher give this in a lesson.

Limiting Elements.—The next step is to teach that a subordinate element *limits* the meaning or extent of the principal elements. This is peculiar to the logical method of teaching grammar, for by the etymological method, the adjectives express the quality of the objects, and the adverbs the quality of the actions. In order to develop the idea of limitation, use the subject first in its full meaning, then unite a word with it that restricts or limits it to a portion of its full meaning, and lead the pupil to see that the office of a subordinate element is to diminish, or restrict, or limit the meaning of the general idea or term.

Model Lesson.—Teacher. When I say, "Girls study," how many girls may I mean? *Pupil.* All girls, or any number of girls. *T.* Suppose I say, "Good girls study," do I mean *all* girls? *P.* No, sir, only a part of girls. *T.* What word is it that restricts or *limits* the meaning of *girls* to only a part of girls? *P.* The word *good.* *T.* What kind of an element may I call *good* which *limits* the meaning of girls? *P.* A *limiting element.* *T.* When I say, "Good girls study," do I mean any particular studying? *P.* No, sir. *T.* When I say, "Good girls study hard," do I mean any particular kind of studying? *P.* Yes, sir, *hard* studying. *T.* What word *limits* the meaning of study to *hard* studying? *P.* The word *hard.* *T.* What kind of an element then is *hard?* *P.* A *limiting* element.

Kinds of Subordinate Elements.—The different kinds of subordinate elements are *words*, *phrases*, and *clauses*. These may be taught by taking an example in which a single word limits the subject, then a phrase expressing the same thing, and then expressing the same with a clause.

Model Lesson.—Teacher? writing on the board, "Normal girls study diligently," says, What word limits or tells the kind of girls? *P.* The word *Normal.* *T.* Suppose I write, "Girls of the Normal study diligently," what now expresses the kind of girls? *P.* The words *of the Normal.* *T.* Such a collection of words is called a *phrase.* Suppose I write, "Girls who live at the Normal study," etc., what now tells the kind of girls? *P.* The words *who live at the Normal.* *T.* Is there a subject or predicate in this expression, "who live at the Normal?" Is it then a sentence? Such a limiting expression is called a *clause.* What kind of words limit nouns? *P. Adjectives.* *T.* What do these three kinds of elements limit? *P.* They limit *nouns.* *T.* What kinds of elements then may we call them? *P. Adjective elements.* *T.* How many kinds of *adjective elements* then are there? *P.* Three—*words*, *phrases*, and *clauses.* In a similar manner, the adverbial elements may be presented, and also the objective elements. The student-teacher should give the lesson.

In presenting the limiting element, we have regarded it as *limiting the application of the general term:* we may also present it as *limiting the extent of the concept.* The former method is in accordance with *Nominalism;* the latter with *Conceptualism.*

III. Methods of Teaching Advanced Grammar.

After the pupils have attained a fair knowledge of the parts of speech, their properties and classification, with the elements of parsing and analysis, they are prepared to take up the subject of grammar in a more thorough and scientific manner. They are then prepared to consider the minutiæ and more difficult points of the subject, to present their knowledge in a complete and systematic form, to discuss the idioms of syntax, to learn and apply the rules of construction, and see the logical relation of the elements of language as determined by the processes of thought.

This higher course should include a continuation of the etymological exercises of the primary course, the committing of the principal definitions of the science, a full course in parsing and correcting false syntax, a complete course in logical analysis, and the grammatical analysis of some of the masterpieces of the language. We shall speak of this course under the several heads, the Study of the Text-book, Formal Parsing, Correcting False Syntax, and Grammatical Analysis.

I. Study of Text-book.—A text-book should now be placed in the hands of the pupils, and regular lessons assigned for them to prepare for recitation. The definitions, as given in the text-book, unless changed by the teacher, should be committed and recited verbatim, care being taken that they are understood. The notes and observations should be carefully studied, and their sense, not the exact words, be required to be given in the recitation.

The pupils should be drilled in declensions, comparisons, and conjugations, until they can run through these exercises with rapidity and accuracy. They should also be drilled on the classification of the parts of speech, and be required to write logical outlines of the same.

In the primary course, the instruction was inductive, in advanced grammar it should be deductive. There, the effort was to lead the pupil to understand the ideas; here, it is assumed that the pupil already understands the leading principles, and is able to acquire other ideas and to recite them. Of course, any subject not understood should be explained, inductively or deductively, as the teacher may prefer.

The Rules should be committed to memory by their numbers, so that they may be readily referred to in parsing and correcting false syntax. Notes on the rules, showing their application to peculiar cases and also the exceptions to them, should be thoroughly studied. Pupils should be drilled in the peculiar use of words, the idioms of construction should be explained, and all the more difficult parts of grammar considered. It is also suggested that the more important subjects be taken the first time of going through the book, leaving the details to be learned on the review. The course, if there is time, should reach up also into the philosophical principles of the subject, and embrace the laws of universal grammar.

II. Formal Parsing.—In connection with the study of the subject in the text-book, there should be regular exercises in *Parsing*. This is an old exercise, which modern analysis has to some extent thrown into the background; but it is of great value, and should not be neglected in grammatical instruction.

Nature of Parsing.—Parsing consists in naming the different parts of speech in a sentence, their classes, properties, and relations. It is a consideration of the grammatical use of words in sentences. Parsing may also be defined as the grammatical description of words in sentences. The term is derived from *pars*, a part. It is an exercise that should be begun as soon as the pupil has learned a few of the elementary ideas of grammar, and should be continued through the entire course of advanced grammar.

The object of parsing is two-fold. First, it affords an opportunity to apply the definitions, classifications, and properties which have been learned. It thus aids the pupils in becoming familiar with the definitions and rules of grammar, by frequent repetition; and teaches them to express their knowledge in a systematic manner. Second, it requires pupils to examine language and ascertain the nature and relation of words in sentences; and this not only gives power in the analysis of language, but cultivates the habit of abstract thought. The object of parsing should be distinctly understood, for teachers too often have acted as if the end of studying grammar is to learn to parse; and their pupils were drilled upon the exercises until they could, with propriety, be called "parsing machines."

For exercises in parsing, we should first use the sentences given in the text-books. As the pupils advance, we should introduce some other work containing good specimens of English literature. The school reader may be conveniently used as a "parsing book." A little work, prepared by Rickard and Orcutt, called *Class-book of Prose and Poetry*, is also recommended. Many of the older teachers of grammar used such works as Thomson's *Seasons*, Milton's *Paradise Lost*, Pollok's *Course of Time*, Cowper's *Task*, Pope's *Essay on Man*, etc.; and they are still recommended to teachers of advanced classes.

Forms of Parsing.—In parsing, beginners should not be required to use complete and logical forms. It is best for them to go over the words, point out the parts of speech, and name such properties as they have studied, and then answer such questions as may be asked by the teacher. The objection to using forms of parsing with beginners is, that pupils will be thinking more about the form than the grammar; and will fall into a dull routine of words instead of thinking of the grammatical relations. Forms of parsing should not be introduced until the pupil is quite familiar with the fundamental ideas of grammar.

In the advanced course, however, pupils should be required to use a definite scheme of statement, which we call *Forms of Parsing.* Such Forms are needed for several reasons. First they economize time by requiring the pupils to tell what they know in a simple, direct, and unhesitating manner. Second, they facilitate criticism, as we can very much more readily detect and remember a mistake when the pupil has a regular order of statement, than when he mentions the properties and relations in a haphazard sort of way.

The forms of parsing should be *simple.* The complicated forms which we sometimes meet with, are a positive disadvantage and hindrance to the pupil. The form is often so complex and difficult that it requires nearly all the mental energy of the learner to follow it, and leaves but little for the grammar proper. Pupils often make mistakes in parsing, not because they do not understand the grammatical relations, but because some part of the form slipped from the memory. Most of the corrections made in the class-room, in a parsing lesson, it is often noticed, are with respect to omissions or variations of the adopted form.

No expressions should be used in the forms that are not clearly understood by the pupils. A violation of this rule is a very common error. Nine-tenths of those who use such expressions as "prepositions *govern* the objective case," "adjectives *relate* to nouns," "adjectives *limit* the nouns to which they belong," "adverbs *qualify* or *modify* verbs, adjectives, and other adverbs," use them without any definite idea of their meaning. If such expressions are used, require the pupils to see clearly what is meant by "govern," "relate to," "qualify," "limit," "modify," etc. It is said that a pupil, on being asked something about the expression "grammatical persons," as used by an author in defining personal pronouns, replied by naming the three principal grammar teachers of the institution.

The full form of parsing should often be dispensed with. When the pupils are familiar with the form, it is a waste of time and patience to have them repeat the same "lingo" day after day. Let a portion of the time be spent in having them point out the relations of words and answer questions upon some of the more important and difficult things connected with the sentence. This will teach them to think grammar, and not merely to repeat formulas.

In parsing, we should generally proceed from word to word in the order of their arrangement in the sentence. Frequently, however, the teacher may select the words to be parsed, as it is often a waste of time to parse all the familiar words. The neglect of this is a common error in teaching grammar. We may also have an exercise in which the pupils are required to parse all the nouns in a paragraph, then all the verbs, then all the adjectives, etc., in their order.

Oral Parsing.—We shall now present a form of *Oral Parsing*. Let the sentence be, "The man who came yesterday gave me a pair of beautiful sleeve-buttons." The form of parsing is as follows:

The is the definite article; it limits *man*. Rule.

Man is a common noun; in the masculine gender, third person, and singular number; it is used as the subject of *gave*, hence it is in the nominative case. Rule.

Who is a relative pronoun; its antecedent is *man*, hence it is in the masculine gender, third person, and singular number. Rule. It is used as the subject of *came*, hence it is in the nominative case. Rule. It introduces the clause, *who came yesterday*, and joins it to *man*. Rule.

Came is an irregular, intransitive verb; principal parts, *come, came, coming, come;* it is in the indicative mode, and past tense; its subject is *who*, hence it is in the third person and singular number. Rule.

Yesterday is an adverb of time; it modifies *came*. Rule.

Gave is an irregular, transitive verb; principal parts, *give, gave, giving, given;* it is in the active voice, indicative mode, and past tense; its subject is *man*, hence it is in the third person and singular number. Rule.

Me is a personal pronoun; in the common gender, first person, and singular number; it is the object of the preposition *to* understood, hence it is in the objective case. Rule.

A is the indefinite article; it limits *pair*. Rule.

Pair is a common noun; in the neuter gender, third person, and singular number; it is the object of *gave*, hence it is in the objective case. Rule.

Of is a preposition; it shows the relation of *sleeve-buttons* to *pair*. Rule.

Beautiful is a descriptive adjective, in the positive degree; it modifies *sleeve-buttons*. Rule.

Sleeve-buttons is a compound common noun; in the neuter gender, third person, and plural number; it is the object of *of*, hence it is in the objective case. Rule.

Written Parsing.—There should be forms of *Written Parsing*, as well as of Oral Parsing. There are several advantages in written parsing. First, it enables all the class to be reciting at the same time. Second, it impresses the relations of words by seeing them written. Third, it leads to an exactness of statement that the oral method does not always attain. This written parsing can be on the blackboard or on paper. The oral and written methods can be combined in the same recitation to great advantage.

We present also a form of written parsing, using the sentence given below. The sentence is first written on the blackboard or paper, a line is drawn under it, and the words are parsed as shown in the form. If too long for the space assigned, the sentence may be divided as in ordinary writing, room being left between the parts of the sentence for parsing the words.

The	man	who	came	yesterday	gave	me	a	pair	of	bracelets
d a	c n	r p	i i v	a t	i t v	p p	i a	c n	p	c n
man	m	man	come	came	give	c	pair	n	pair	n
	3	m	came		gave	1		3		3
	s	3	coming		giving	s		s		p
	gave	s	come		given	(to)		gave		gave
	n	came	i		a	o		o		o
		n	pa		i					
		man	who		pa					
			3		man					
			s		3					
					s					

It is thought that the abbreviations used explain themselves. If they do not, a reference to the forms of oral parsing will make them clear. For a fuller presentation of the subject, see Lyte's *Grammar and Composition*, published by D. Appleton & Co.

Errors in Parsing.—Errors in Parsing consist of three classes; first, errors in stating the part of speech to which a word belongs, its properties, construction, etc.; second, errors of expression; third, errors in the form of parsing. Some of these errors are the result of a want of knowledge on the part of the pupil, some arise from carelessness, and others are due to the adoption of incorrect forms on the part of the teacher.

Errors of expression include the mispronouncing of words, such as "nomitive" for "nominative," "singlar" for "singular," etc.; the improper omission or contraction of words, such as, "John 's a proper noun" for "John is a proper noun;" the use of ungrammatical or awkward expressions, such as "nominative case, subject of is," "nominative case governs the verb," etc.

The forms of parsing used by many teachers and presented in some of our text-books, contain expressions which are awkward. We call attention to a few of these expressions, suggesting that teachers be especially careful in a grammar recitation to teach correctness and elegance of expression.

Thus, "*John is a noun, proper*," is as awkward as "John is a man, aged," which no one would use in natural expression. Again, we often hear, "*John is a noun, proper, masculine gender;*" which really says that John *is proper, is masculine gender.* This is of course incorrect, as it is not *John* that is *proper*, but the *noun* John.

Pupils often use the expression, "*according to rule.*" This is too general an expression; a carpenter builds a house "according to rule," etc. We should say, "according to Rule 1," etc.; or, "according to the rule," keeping the voice suspended, and repeating the rule.

Pupils often have the habit of using the word *and* immediately after naming the part of speech; as, "*The* is an article, *and* belongs," etc. "*Of* is a preposition, *and* shows the relation," etc. In these cases there are two distinct thoughts, the second not being a continuation of the first, and therefore not to be coupled with it. We should not say, "Mary is a girl and studies her lesson," but "Mary is a girl; she studies her lesson." In the same way it is better to say, "*The* is an article; it belongs," etc.

Pupils often use the expressions, "Third person, *it* is spoken of," "Second person, *it* is spoken to," etc., thus confounding the noun which they are parsing with the person or thing denoted by the noun. "Third person, it denotes the person spoken of," "Second person, it denotes the person spoken to," etc., are better forms. The teacher should correct these and other errors which he meets in parsing, for the language used in reciting grammar should be grammatical.

III. Grammatical Analysis.—Within a comparatively short period of time, there has been introduced into grammar a logical method of considering the sentence, which has received the name of *grammatical analysis*. It has done much to improve the study, and is regarded as of great importance in a system of grammatical instruction.

Nature of Analysis.—In the etymological study of grammar, words are considered as parts of speech, and classified into *nouns*, *verbs*, etc. These individual words perform certain offices in the construction of sentences and receive their names from the offices which they perform. By and by it is observed that collections of words have an office in sentences similar to many of the parts of speech. It is also seen that all sentences may be regarded as consisting of two principal elements, several subordinate or modifying elements, and several connective elements. The discussion of a sentence with respect to all these elements has been called *Grammatical Analysis*.

The Elements.—Grammatical Analysis regards the sentence as consisting of three classes of elements; the *principal ele-*

ments, the *subordinate elements*, and the *connective elements.* The principal elements are the *subject* and *predicate ;* the subordinate elements are the *adjective*, the *adverbial*, and *objective* elements ; the connective elements include the *preposition*, the *conjunction*, the *relative pronoun*, etc. Besides these, there is sometimes an element having no relation to the other elements, called an *independent element.* All sentences are regarded as composed of these elements, which elements may be represented by individual words, or by collections of words.

Importance of Analysis.—The importance of grammatical analysis in the study of language can hardly be overstated. It gives one an insight into the principles of the structure of a sentence that can be obtained in no other way. It lifts the subject up into the domain of logic, and enables one to examine the sentence in the light of those forms of thought which give rise and shape to the sentence. It enables one to see some of the functions of the parts of speech that do not appear in the etymological study of words. Thus, the full office of a relative pronoun cannot be appreciated until we see that it joins a restrictive clause to some word, and the idea of a restrictive clause is given by analysis. So also the antecedent term of the relation of a preposition is not always evident until we see the relation of the modifying phrase which it introduces.

Analysis thus becomes a powerful instrument in the hands of the grammarian for understanding the grammatical relations of language. Some writers go so far as to say that "grammar can be successfully studied in no other way." Dr. Wickersham says that "parsing without a preceding analysis can lead to but a very imperfect knowledge of the organic structure of sentences." Prof. Whitney remarks, "Give me a man who can, with full intelligence, take to pieces an English sentence, brief and not too complicated, even, and I will welcome him as better prepared for further study in other languages than if he had read both Cæsar and Virgil, and could parse them in the routine style in which they are often parsed."

Order of Parsing and Analysis.—The order of instruction in grammatical analysis and etymological parsing is a subject upon which authors are not agreed. The old method was to begin with the study of words; and, after quite a full knowledge of their etymological properties, to pass to the analysis of sentences. A large number of recent writers maintain that we should begin with the sentence and present the logical elements before we teach the parts of speech. "Since the *general* precedes the *special*," says one writer, "the treatment of sentential analysis should precede any exercises in parsing." Several grammarians endeavor to construct their text-books on this principle; but most of them drop unconsciously into the etymological consideration of words before presenting their logical use.

It is our opinion that grammatical analysis should follow the etymological consideration of words. There are several reasons for this opinion. First, the logical elements used in analysis are really a generalization of the uses of the parts of speech. Grammatical analysis was really the outgrowth of grammatical parsing, by a generalization of the etymological uses of words. Thus, we should understand the use of a *word* as an *adjective* before we are able to see clearly the adjective use of a *phrase* or a *clause*. It thus follows the order from the particular to the general, which is the correct order for primary instruction. This was also the historic order—parsing was in use a long time before grammatical analysis was thought of—and the historic order often indicates the order of teaching.

It is also much easier to begin with the etymological method. A pupil will find it very difficult to understand the use of the logical elements before he is familiar with the use of words as parts of speech. An adjective or adverbial element will hardly have any meaning before the pupil is familiar with the adjective and adverb. The idea of *limitation*, which is the analytical idea of an adjective and adverbial element, is much more difficult for a beginner than the etymological idea of adjectives as expressing *qualities* of objects and adverbs as expressing *qualities* of actions. The very nomenclature in logical analysis is derived from the use of words as parts of speech. The two, however, should be combined as early as possible, as the analysis will often aid the parsing. In advanced grammar, analysis may even precede parsing.

How Teach Analysis.—Logical analysis is thus best taught to beginners by a generalization from the nature and use of the parts of speech. Thus it may be seen that the noun, which was primarily a name, is often the subject of an assertion, and that the verb, which was primarily an action-word, is used to assert or predicate something of the subject It may then be shown that several words may express the subject of the assertion, and also that several words may express the predication. Again, it may be seen that the adjective, which expresses primarily a *quality* of an object, may be used to limit the meaning of the noun, and also that the adverb may *limit* the meaning of a verb; and rising from this idea, we may see that a collection of words may perform the office of an adjective or an adverb, and thus become a *limiting element.* In this way the learner may reach a clear idea of the logical elements of sentences.

It is recommended that the elements of analysis be presented as early in the course as pupils are prepared to understand it. After the pupil is familiar with the parts of speech and their general offices, he may be led to the idea of a subject and a predicate, and to see that collections of words perform the same office in the construction of sentences as individual words. He may thus be led gradually into the generalizations of grammatical analysis.

At a certain stage of grammatical instruction it is recommended that a purely "logical" method of treating the sentence be presented, the pupil being taught to look at the structure of a sentence through the thought. This will give him additional power in the analysis of language, as it enables him to look at the grammatical constructions through the medium of thought, which gave it existence and moulded it into its present form.

He may be led to a clear idea of *ideas*, of their comparison giving rise to *judgments*, which expressed, give the *proposition;* and then learn to distinguish the subject and predicate of the proposition. He may then pass to the idea of the *limitation* of the extent of a concept, and thus of a *limiting element;* and see that these may consist of words, phrases, and clauses. In this way he can reach the details of analysis, passing down until it meets its complement, parsing, in the etymological use of the individual words of which a sentence is composed.

This logical analysis may be presented less subjectively by regarding the *words* as denoting *objects*, *classes*, etc., instead of *ideas;* and the *subordinate elements* as *pointing out* or *distinguishing* particular *individuals* or *classes*, instead of *limiting* the *ideas;* or as limiting the *application* of the term rather than limiting the *idea* or *concept*. This latter method is more objective than the former and probably a little simpler; but it does not seem so closely related to the laws of thought as the logical method previously described. It would no doubt be more acceptable to the "nominalist" than the former method.

Methods of Analysis.—The logical analysis of a sentence may be presented in two distinct ways, which may be distinguished as the analytic and synthetic forms. By the former method, we first name the sentence as a whole, then separate it into its parts, naming the entire subject and the entire predicate, then pass from the entire subject to the simple or grammatical subject, and name its limitations, and proceed to an analysis of each of those elements; and then analyze the predicate in the same manner.

By the other method, we first name the sentence as a whole, then name the simple subject, then the subordinate elements which limit it, giving an analysis of these subordinate elements, then put the simple subject and its subordinate elements together and name the complete or logical subject; and then proceed in the same manner with the predicate, passing from the simple to the entire or logical predicate.

These two methods are very nearly opposite in form, though they do not differ in spirit. Some teachers prefer one method and some the other, though it is difficult to tell which is preferable. The synthetic is probably a little easier, as it gives a little more time to see what the full subject or predicate of the assertion is. It should be noticed that the synthetic form of statement is just as much an exercise in logical analysis as the analytic method; the spirit is the same, the only difference is in the form or order of statement.

Forms of Analysis.—We shall now present some forms for oral and written analysis. The necessity of such forms is clear from what has been said in regard to forms for oral and written parsing. The forms for analysis should possess the same attributes as those for parsing; that is, they should be simple, clear, and logical. The forms presented are nearly the same as those used by Prof. E. O. Lyte in his *Grammar* and *Composition.* To illustrate, we take the sentence used to represent the forms of parsing,—"The man who came yesterday, gave me a pair of beautiful sleeve-buttons."

Oral Analysis.—This is a complex declarative sentence. *Man* is the subject; it is limited by *the*, an article, and *who came yesterday*, an adjective clause; *who* is the subject of the clause; it is used also as a subordinate connective; *came* is the predicate; it is limited by *yesterday*, an adverb. *Gave* is the predicate of the sentence; it is limited by *to me*, an adverbial phrase; *to*, understood, is a preposition, connecting *gave* and *me*; *me* is the object of *to*; *gave* is also limited by *pair*, its object; *pair* is limited by *a*, an article, and *of sleeve-buttons*, an adjective phrase; *of* connects *pair* and *sleeve-buttons*; *sleeve-buttons* is limited by *beautiful*, an adjective.

WRITTEN ANALYSIS, OR OUTLINE.

C^x. D. | man^{s}
  The^{art}
  adj | who$^{s\ sc}$
  | came^{p}
    yesterday^{adv}
gave^{p}
  (to)^{p} me^{o}
  adv
  pair^{o}
    a^{art}
    of^{p} sleeve-buttons^{o}
    adj beautiful^{adj}

Some teachers prefer a slightly different method of stating the analysis. Thus, instead of saying, "it is limited by *who came yesterday*, an adjective clause," they say, "it is limited by *who came yesterday*, a clause used as an adjective." Still another method is, "it is limited by the adjective clause *who came yesterday*," which we like about as well as the model we have given. It is a question whether we should name the parts of speech in analysis; thus, whether we should say, "it is limited by *the*, an article," or rather, "it is limited by *the*, an adjective element," or "by the adjective element *the*." Logical analysis may be complete without mentioning or even knowing the parts of speech; though it is convenient to use the name of the part of speech when the element is a single word.

Mixed Method.—There is also a method of disposing of sentences that combines analysis and an abridged method of parsing, which may be called a *mixed method* or *grammatical description*. This is a valuable practical method, and is recommended for the use of pupils who are familiar with the elements of parsing and analysis. The method may be illustrated with the sentence, "The man whom I saw yesterday lives in Boston." We present it in two different forms; one being somewhat synthetic and the other somewhat analytic.

First Form.—The man whom I saw yesterday lives in Boston. This is a complex, declarative sentence. *The* is an article; it is used to modify *man*. *Man* is a noun; it is used as the subject of *lives*. *Whom* is a relative pronoun, its antecedent is *man;* it is used as the direct object of *saw;* it introduces the clause *whom I saw* and joins it to *man.* *Whom I saw* is a clause used as an adjective; it modifies *man.* *I* is a pronoun; it is used as the subject of *saw.* *Saw* is a verb; its subject is *I.* *Yesterday* is an adverb; it is used to modify *saw.* *I* is the subject of the clause, and *saw whom* is the entire predicate. *Lives* is a verb; its subject is *man.* *In* is a preposition; it is used to introduce the phrase *in Boston,* and join it to *lives.* *In Boston* is a phrase used as an adverb; it modifies *lives.* *Boston* is a noun; it is used as the object of *in.* *The man whom I saw yesterday* is the entire subject of the sentence, and *lives in Boston* is the entire predicate.

Second Form.—The man whom I saw lives in Boston, is a complex sentence. *The man lives in Boston* is the principal clause, and *whom I saw* is the subordinate clause. *The man whom I saw* is the entire subject; and *lives in Boston* is the entire predicate. *Man* is a noun used as subject of *lives.* *The* is an article, used to modify *man.* *Whom I saw* is a clause, used as an adjective to modify *man.* *I* is a pronoun, used as subject of *saw.* *Saw* is a predicate verb; its subject is *I.* *Whom* is a relative pronoun; as a pronoun it is used as object of *saw,* as a relative or subordinate connective it introduces the clause *whom I saw,* and joins it to *man.* *Lives* is a predicate verb; its subject is *man.* *In Boston* is a phrase used as an adverb to modify *lives.* *In* is a preposition used to show the relation of *Boston* to *lives.* *Boston* is a noun used as the object of *in.*

Errors in Analysis.—Errors in analysis consist of two classes: first, errors in stating the classification and elements of a sentence; and second, errors of expression. Errors of expression include the misuse of terms, such as *clause* for *phrase*, *sentence* for *clause*, or *member;* the needless repetition of terms, such as "of which," the use of unnecessary terms, such as "elements of the second class," "elements of the third class," etc. A very common error in forms of analysis is the use of long and involved sentences in which the thought becomes obscured in the construction. The different points should be simply and directly stated.

In written analysis, the commonest errors are,—errors of *arrangement*, and errors in writing the *abbreviations*. The teacher will be careful to guard against the following mistakes: Drawing the lines too long, or in an oblique direction;

failing to write the modifying words and the connectives in the proper places; writing the predicate too far below the subject; failing to write the proper abbreviations in the right place, and in a smaller hand than that used in writing the sentences.

Diagrams for Analysis.—Several efforts have been made to devise some form of written analysis which will *picture* the grammatical relations to the eye. The most prominent of these methods is that of Prof. Clark, called the "diagrammatical method," given in Clark's grammar. A method of graphic analysis that looks well upon the board is that given in Reed and Kellogg's grammar. It is supposed that such a representation aids the learner in grasping the grammatical relations of words, on the principle that the abstract idea may be seen through the pictured form. The objection to some of these methods is that it often requires more ingenuity to prepare the diagram than to understand the grammatical relations. If used at all, they should not be made prominent, or a pupil will become so dependent upon them that he will be unable to see the grammar of a sentence except through the medium of a diagram. Used occasionally for illustration, they may be of value to the student; but when employed as a regular method of recitation, we believe them to be objectionable.

IV. Correcting False Syntax.—By False Syntax we mean constructions in language which violate the laws and usages of grammar. The principle upon which the correction of false syntax is based in teaching grammar, is that we learn the true by seeing the false; as the Spartans taught their children temperance by showing them the silly actions of the Helots when intoxicated.

The object of correcting false syntax is twofold. First, it gives a clearer knowledge of the rules of syntax, and their application to language; second, it impresses the correct form of the sentence, and leads us to avoid the errors with which we are thus made familiar. Its importance in a course of grammatical instruction is thus apparent: it aids the pupils in obtaining a more thorough knowledge of the rules of grammar, and trains them to acquire correct habits in the use of language.

The exercises selected should in the main be such as actually occur in conversation and writing, and not all sorts of impossible errors. It is hardly worth while to manufacture errors such as may never be heard or seen in language, as enough actual mistakes may be found to illustrate every rule. The errors of common conversation should be made especially prominent, as "Please let John and I go home," "Who did you see," "Who were you with," etc. We should also have examples of the mistakes involving the nicer distinctions of grammar, as the use of *shall* and *will*, the forms of the irregular verbs, and the popular tendencies to depart from the strict rules of syntax. The slips of eminent writers will be found useful to impress upon the minds of pupils the necessity of being careful in writing.

The exercises in false syntax should be used in connection with parsing and analysis. They may be given along with the etymological exercises of the book after the correct forms have been explained. Some authors, as Goold Brown, give a large collection of such exercises under the detailed discussion of the rules of syntax, which is a very convenient method of considering the subject. Some teachers recommend that the exercises be graded, following the order of the sentence, proceeding from the simplest form of the sentence in the first step to the most complicated form in the last step; but, though such a treatment would be logical, it is a question whether it would possess any practical value.

Forms of Correcting.—With beginners, as already stated in the primary course, no special form is to be used in recitation, the object being to call attention to the error and correct the practice. With the advanced course, some definite form should be used by the pupils in recitation. This form, as in parsing and analysis, should be as simple as is consistent with a clear and complete statement of the nature of the error and its correction. The teacher may have his pupils use a full form until they are familiar with it, and then pass to an abbreviated form. Frequently in the recitation, all form should be dispensed with, the pupil merely being required to state the error and the correction. We present several forms, as suggested by Prof. Byerly, and used by him in his classes.

First Form.—The first method of correcting false syntax embraces five distinct things: 1. The pupil states that the sentence is incorrect; 2. He shows wherein the rule is violated; 3. He quotes the rule violated as authority; 4. He states what should be omitted, supplied, substituted, or changed; 5. He gives the sentence in its correct form. To illustrate, take the sentence, "Who went? Us girls."

Illustration.—"*Who went? Us girls.*" This sentence is incorrect; because "us," a pronoun in the objective case, is used as the subject of "went"; but according to Rule I., A noun or a pronoun used as the subject of a finite verb must be in the nominative case; therefore, instead of "us," "we" should be used; and the sentence should be, "Who went? We girls."

Second Form.—Another method is that which gives the *result* first and the *reason* afterward. It differs from the first, as the last two steps of that are made the second and third in this. We illustrate with the same sentence.

Illustration.—"*Who went? Us girls.*" This sentence is incorrect; instead of "us," "we" should be used; and the sentence should be,—"Who went? We girls"; it is incorrect because "us," a pronoun used as the subject of "went" understood, is not in the nominative case; but according to Rule I., etc.

Other Forms.—Other methods, less formal than these, may also be used. Thus, we may *name* the *error*, then the *correction*, and then give the *reason* for the correction by *quoting* the *rule*. Another form, which we should often use, is that in which the pupil reads the sentence as given, and then simply reads it as corrected.

Errors in Correcting.—There are several erroneous expressions to which pupils are liable in correcting false syntax, which should be avoided. First, the pupil should not be allowed to say "'us' should be changed to 'we'", as that cannot be done. Second, the pupil should not say "The sentence should read"; but rather "the sentence should be."

Written Exercise.—There may also be a written exercise in correcting false syntax. The teacher may dictate the sentences and have them written on paper or on the blackboard, and then have them corrected by drawing a line under the incorrect word and writing the correct word below it. Or the teacher can write several sentences on the board, numbering them in the order in which they are written, and require the pupils to write them correctly, indicating them by the proper numbers. When written on paper, they may be read or handed to the teacher to look over out of class, and be returned at the next recitation.

Some of the sentences assigned should be correct, some should contain an error to be corrected, and some should have introduced into them some error, easily detected, to hide, as it were, some other error not so easily observed. The teacher, of course, should inform the class that some of the sentences are correct, some contain one error, some two errors, etc. It will be well to introduce all kinds of linguistic errors in these exercises. Thus the sentences presented may contain errors in spelling, in the use of capitals, in punctuation, in the use of words, etc.

Exercises in false syntax are usually found in the text-book, and may be studied by the pupil before coming to the recitation. The teacher may also prepare a list of such incorrect sentences as seem to him likely to be used, and also of such as he has met with in his reading or has heard in the vicinity of the school. He should encourage his pupils to prepare a list of incorrect sentences which they may hear used, and also to examine the books they are reading to see whether they can detect any errors in grammar. Such an exercise will make their grammatical sense very susceptible and accurate, and lead to great care in their own use of language.

In conclusion, we remark that, with the more advanced classes in parsing and analysis, we should not restrict ourselves to the mere technicalities of grammar, but should extend the exercise so as to cover the whole subject of language. We may call attention to the meaning of words, to the peculiarities of their use, to the etymology of prominent terms, to idiomatic constructions, to the allusions of history and mythology, to the use of capitals, punctuation marks, etc. We should combine the elements of rhetorical parsing with grammatical parsing, and so conduct the exercise as to give the pupil a knowledge of the correct use of language in its widest sense, and cultivate a critical and appreciative literary taste. In this way an exercise in parsing and analysis may be made one of the most interesting and valuable exercises in the entire course of study.

CHAPTER IX.

TEACHING COMPOSITION.

COMPOSITION is the art of expressing our ideas and thoughts in words. It is the art of telling what we know, or of embodying our knowledge in language. This knowledge may consist of facts which we have observed, heard, or read; or of thoughts which we may have acquired by conversation and reading, or developed by thinking.

Importance.—Composition is one of the most important branches taught in our schools. It does more to prepare a pupil for success in many departments of life than almost any other branch. It also affords valuable culture to the mind, for it requires closeness of observation, fullness and readiness of memory, and the power of original thought and generalization. It is valuable for its own sake; the art of correct and elegant expression is an accomplishment to be highly prized. It also cultivates a literary taste that enables one to appreciate the works of literature, and thus becomes a source of the most refined and exquisite pleasure.

Composition is also, when properly taught, one of the most interesting and delightful of the common school branches. The popular dread of composition writing is due to the fact that it has been so poorly taught in our schools. There can be no intrinsic repulsiveness in writing compositions. Children love to talk, they delight in expressing their ideas and feelings; and if they are taught to understand that composition is merely writing what they know and think, as they would talk it, pupils would take delight in writing compositions, and long for "composition day" more than they now dread it

Errors in Teaching.—The errors in teaching composition are numerous. Our methods give pupils a wrong idea of the nature of composition writing. Many pupils seem to have the idea that writing a composition is trying to express what they do not know, or the stringing of words together after some mechanical model, instead of merely writing simply and naturally what they know or think about something. Pupils have been required to write compositions without any instruction or preparation for the exercise, and allowed to write blindly without any assistance. The subjects assigned are often unsuited to pupils, being too abstract and difficult. Teachers have made the subject too formal, and thus taken all the life, freshness, and zest out of it.

Such teaching has given the pupils of our public schools a dread of composition-writing. They regard it as the "bugbear" of the school-room; and think of "composition day" with a shudder. They perform the allotted task without any interest, merely because they are compelled to do so. They put it off to the last moment, and slip out of it whenever they can. They copy their compositions out of books, or get some older pupils to write for them. They acquire stilted and artificial forms of expressing themselves, instead of writing in that natural and interesting style in which they converse.

There is great need of reform in this respect, and this need seems to be widely felt. It is an oft-repeated question, How shall we improve our methods of teaching composition? Our educational periodicals are crowded with criticisms of the old methods and suggestions for improvement. Authors are turning their attention to the subject, and text-books are multiplying upon it. Our grammars are growing more practical, and text-books on Language Lessons, designed to teach expression, are becoming abundant.

Division of the Subject.—In the discussion of the subject, we shall speak first of the Preparation for Composition Writing, and secondly, of the Methods of Teaching Composition

The Preparation for Composition will include a statement of those conditions and that culture which prepare a pupil for writing. Instruction in Composition will embrace first that primary instruction which is designed to prepare a young pupil to express himself in writing with correctness and freedom. These exercises are now popularly known as *Language Lessons.* Under the second head we shall present some formal directions for *Writing a Composition.*

I. Preparation for Composition Writing.

Conditions.—The fundamental conditions of composition are,—first, something to say, and secondly, how to say it. In other words, composition-writing includes the *matter* and the *expression.* The matter consists, in a general way, of *ideas* and *thoughts.* For the expression of these, we need a large and choice vocabulary of *words*, and a finished and accurate *style of expression.*

The first requirement in writing composition is, that there shall be something to say; when there is nothing in the mind, nothing can come out of it. Here is the mistake of many teachers, who expect children to express ideas on a subject when they have no ideas to express. Ideas, thoughts, knowledge in the mind, it should be remembered, are the necessary antecedents to expression. In the second place, there must be something with which to express what we know. Our knowledge must flow out in the form of words; and we must be familiar with individual words and know how to use them. The third condition is that we shall acquire a clear and correct method of expressing our thoughts; and cultivate, so far as possible, those graces of style which give beauty and finish to expression. Let us inquire how each one of these conditions is to be attained.

Sources of Material.—The materials of composition, as already stated, are ideas, facts, thoughts, sentiments, etc. There are several sources of these materials. The principal sources of our ideas and thoughts are Observation, Reading, Judgment, Imagination, and Reflection.

Observation.—Many of our ideas come from the observation of the objects of the material world. The facts which we express are drawn largely from our experience of things and persons. Nearly all the great writers have been close observers of nature and human nature. Homer was in deep sympathy with the material world, and drew some of his finest figures from his observation. Shakespeare was a devoted lover of nature, and gives us hundreds of pictures like "The morn in russet mantle clad, walks o'er the dew of yon high eastern hill," showing how close and accurate was his observation. Dickens drew many of his characters from actual persons whom he knew, and whose peculiarities he had carefully studied.

Pupils should, therefore, be taught to observe closely and accurately. Objects should be presented to them to examine and describe. They should be required not only to observe the principal features, but also to notice the minutiæ of things. Observation should be analytic, descending to the minor and less obtrusive parts of objects. Trained in this way, a pupil will acquire accurate ideas of things, and be able to point them out and to describe what he has seen with ease and accuracy.

Reading.—We can also obtain ideas and thoughts by Reading. In books we find facts, ideas, sentiments, opinions, figures of rhetoric, etc., which remain in our memory and may be used in their original form, or become types for creations of our own. In books are embalmed the choicest productions of the master minds; and they enrich the mind of the reader, and give wisdom to his thought, and grace to his utterances. Young persons should cull in their reading the finest passages, and write them down and commit them. They should also take note of the interesting and important facts in their bearing on the subject, and fix them in the memory. An effort should be made to become familiar with the opinions and noble sentiments of the great thinkers, for in this way thought will be enriched and expression beautified.

Judgment.—Pupils should be taught to exercise the Judgment as well as the eyes and ears. They should be taught to compare things, to see their relations, and to draw inferences from them. They should be required not only to see, but to think about what they see; and to form opinions concerning it. It is this observing with the judgment that makes the philosopher. By it Copernicus attained to the true idea of the planetary system, and Newton reached the great law of universal gravitation.

Imagination.—Pupils should be taught also to exercise the Imagination. Every form of nature not only embodies an idea, but may be perceived as the symbol of an idea. The things of the material world are typical of the things of the spiritual world; they are often the symbols of ideas and sentiments and feelings. Here is the source of personifications, similes, metaphors, etc. The flower looks up into our eyes, the streamlet bathes the brows of the drooping violets, the stars are the forget-me-nots of the angels, etc. It is the office of the Imagination to catch these analogies, to transmute the material thing into the immaterial thought, and "give to airy nothing a local habitation and a name."

The Imagination may thus be taught to leap from the visible form to the invisible image. Things may become the ladder by which it rises to the sphere of beautiful and poetic thoughts. Thus, Shakespeare gives us the figure "How sweet the moonlight sleeps upon this bank;" Alexander Smith says, "The princely morning walks o'er diamond dews;" and Longfellow gives us the picture of a "silver brook" which "babbling low amid the tangled woods, slips down through moss-grown stones with endless laughter." The attention of the learner should be called to these and similar creations, and he should be encouraged to create images of his own.

Reflection.—Much of the material of compositions comes from Thinking. We must therefore learn to think in order to learn to write. It is not enough to acquire the thoughts of others; we must learn to evolve thoughts for ourselves. We must cultivate a reflective and creative cast of mind that seeks for the idea lying back of the fact, that searches for the cause of the phenomena, and is ever inquiring what these facts prove, or what principle they illustrate or establish. We should endeavor to originate new forms of expression, new figures of rhetoric, and to form ideas and opinions of our own on many subjects.

Sources of Words.—The second condition of becoming a good writer is the acquisition of words. In order to write, we must not only have ideas and thoughts, but we must have language in which to express them. The thought is to be incarnated in speech. Ideas and thoughts existing in the mind, intangible and invisible, are to be transmuted into audible or visible forms. Nature, as it were, goes into the mind through the senses, and reappears in the form of language. Form and color and tone in the natural world, give form and color and tone to expression. The freshness of spring, the brightness of summer, the rich tints of autumn, and the silver habit of winter, all give freshness and beauty and glory to the literature and language of a people. These words may be acquired in several ways.

Instinct.—Words are derived partly by an instinctive habit. We pick them up in conversation without any conscious effort. A child will often be heard to use words which it but a short time before heard some one else make use of. Children seem to have an instinct for language, and new words cling to their memory like burrs to the garments. A child of four years of age may be able to speak three or four different languages if it has had an opportunity to hear them spoken. It is, therefore, of great advantage to a child to hear a large and expressive vocabulary used in the household.

Conscious Effort.—Words should also be consciously acquired. There should be a special effort made to enrich the vocabulary. We should notice the words in our reading, and make a list of new words, or of those which we may think do not belong to our practical vocabulary. Such a list may often be reviewed until the mind becomes familiar with it. We should also make use of these words in our conversation and in writing. It is surprising how rapidly we would improve in expression by the adoption of this method. Our vocabulary, which is often small, smaller than we think, will become enlarged; and we will learn to speak and write with a copious, rich, and elegant expression.

The Dictionary.—The pupil should form the habit of studying the Dictionary. The dictionary has sometimes been used as a text-book in schools, but this is not recommended; it should, however, be a student's constant companion. It should lie on every student's table, and be frequently consulted. This has been the habit of some of the most accomplished scholars and writers. Charles Sumner was a most assiduous student of the dictionary. He had several copies in his library in constant use, and usually carried a pocket edition with him; and they were found, after his death, to be the most thumbed of any of his books. Lord Chatham went twice through the largest English dictionary, studying the meaning of each word and its various uses.

General Reading.—An extensive course of general reading is valuable in acquiring a large and choice vocabulary of words. Such reading should be largely confined to our best authors, those who use words with correctness and artistic skill. The finished and thoughtful writer often puts a meaning in a word which we never noticed before, and thus stamps it upon our memory. It is only in this way that we can acquire that nice and delicate sense in the use of words which distinguishes the refined and scholarly writer.

Ancient Languages.—The study of the ancient languages is especially valuable in this respect. It was formerly thought that a knowledge of Latin and Greek was necessary in order to understand the English language; but this claim is now seldom made. The great value of their study consists in the constant use of English words in the translations, and in the comparison and weighing of the sense of the various words given in the definitions to see which will express the meaning of the text the most accurately. If the student should forget every word of Latin and Greek the year after he leaves college, the linguistic culture he has received is a permanent possession, and will enrich his expression.

Small Words.—In the choice of words, young pupils should be careful not to select merely the large words. The large words attract the attention and are the most liable to be remembered. It is the little words, however, that are the most expressive, and are the most artistic in use. The good old Anglo-Saxon basis of our speech contains a richer and more expressive meaning than the larger Latin and Greek derivatives. Our best writers delight in the skillful use of the small words; and this is an especial characteristic of Shakespeare and our English Bible.

This caution is the more necessary, as young persons have an idea that large words indicate learning and profundity of thought. Göethe refers to this when he makes Mephistopheles say to Faust, "For that which will not go into the head, a pompous word will stand you in its stead." This is quite a general opinion among the uncultured. The man who came to his minister, frightened at a strange appearance of the sun, was entirely satisfied when he was told that it was "only a phantasmagoria." Hazlitt, referring to the use of large words, says, "I hate anything that occupies more space than it is worth; I hate to see a load of empty bandboxes go down the street, and I hate to see a parcel of big words without anything in them." Leigh Hunt gave a fitting reply to a lady who asked the question, "Will you venture on an orange?" by his answer, "No, thank you, I fear I should fall off." Let the pupil, therefore, not select the large words, but learn to use the little words, the language of the heart and home, with skill and artistic effect.

Style of Expression.—We not only need ideas and thoughts, and a rich vocabulary in which to express them, but we need also to know how to put these words together to produce the best results. We need to acquire a good style of expression. We need to acquire that ease and elegance of expression and that artistic skill in the use of language, which distinguishes the cultivated writer. In order to aid the pupil in this, several suggestions are made.

Read Extensively.—First, we remark that pupils should *read extensively.* Reading not only gives words, but it gives facility in the use of words and the expression of ideas. Pupils who have read most are usually the best writers. We often find in school those who are deficient in the more difficult studies, yet who write excellent compositions; and upon inquiry, learn that they have read a great deal, perhaps merely novels. The best scholars in the school branches are often very poor writers, because they have done but little reading. By reading, we become familiar with the style of an author, and form a style of our own. Many distinguished men have formed their style by reading a few books very thoroughly. Lincoln received his language culture very largely from reading the *Pilgrim's Progress.* Kossuth's masterly knowledge of English was acquired by the study of Shakespeare and the English Bible. The unique and expressive language of uncultured men, derived almost entirely from reading the Bible, has often been a surprise to us and demonstrated the utility of reading in acquiring a style of expression.

Copy Productions.—Pupils should be required to *copy literary productions.* Copying an author will make a deeper impression than even a careful reading of one. Sight strikes deeper than sound; to execute form stamps it upon the memory like a die. To go over a production, word by word and sentence by sentence, writing it out, will impress the style of the author deeply upon the literary sense. I would therefore require pupils to "copy compositions." If a paragraph could be written every day on the slate or on paper, it would greatly aid the literary growth of the pupil. Many eminent writers have practiced copying the productions of the masters of literature. Demosthenes copied the history of Thucydides eight times, in order to acquire his clear, concise, and elegant style.

Commit Extensively.—Pupils should be required to *commit extensively*, both prose and poetry. Committing will make a deeper impression than either reading or copying. It will tend to fix the words and deepen the channels of thought and expression. It will, as it were, give one literary moulds in which to run his own thoughts, or dig out literary channels in which our thoughts and sentiments may flow. This has been the practice of all who have obtained excellence in the use of language. Burke and Pitt cultivated their wonderful powers of oratory by committing the orations of Demosthenes. Fox committed the book of Job, and drew from it his grandeur and force of expression. Lord Chatham read and re-read the sermons of Dr. Barrow until he knew many of them by heart.

Declamation.—The old practice of "declaiming pieces" was of very great value to students in the culture of literary power. It gave them models of style and stimulated expression. Indeed, it often did more to give a command of English than the whole college course. We have noticed the style of young men after their graduation at college, and could, in several instances, trace it back to the culture derived from their declamation pieces.

All this preparation for writing requires time and patience. It cannot be acquired in a few months or a year, but is a matter of gradual development. Literary skill is the result of *literary growth.* A student can master a text-book in geometry or algebra in a few months; but literary culture is the work of a life-time. It is an organic product, like the development of a tree. The exercises should be continued day by day, and the result will crown the work. We shall now proceed to the second division of the subject,—The Methods of Teaching Composition. We shall divide the subject into two parts; *Language Lessons* and *Composition Writing.*

II. Language Lessons.

The preparatory exercises required for young pupils in learning to understand and use the English language with skill, have, by common consent, received the name of *Language Lessons.* By Language Lessons we mean such elementary training in the use of language as shall enable a pupil to understand and appreciate language, and to use it with correctness, ease, and elegance.

Nature and Importance.—Of the importance of such lessons there can be no doubt. The primary object of education in language is to *learn to use language.* In order to learn the correct use of language, we must notice and use language. The use of language is an art; and we learn the art by imitation and practice. In order to learn to talk well, we must hear good talking and practice talking. In order to learn to write well, we must notice good composition and practice writing ourselves.

A system of Language Lessons conforms to nature's method of teaching language. The little child, prattling in its mother's arms, is engaged in its first lessons in composition. The simple name, the quality and action word, the short sentence, etc., all come in the natural growth of the power of expression. In teaching, we must observe nature's method and follow her golden rules. A correct system of language lessons is founded upon the way in which a little child naturally learns oral and written language.

A system of language lessons will also teach a child to acquire and produce knowledge as well as to express it. It cultivates the habit of observation and comparison; and thus leads a child to think as well as to express thought. Subjects should be assigned that require attentive examination, that call the judgment into activity, and that lead the pupil to investigate and discover facts, and thus gain knowledge for himself. The pupil will also be taught to classify the knowledge obtained from reading, to sift its true meaning, and to express in his own words the thoughts of the writer he has studied.

The fundamental principle of these lessons is that pupils are to be taught the practical use of language by the *use of language* rather than by a study of the *principles* of language. There should be an imitation of models, and a free and spontaneous expression of ideas, without any thought of the grammatical rules or principles involved. For example, the pupil should express himself in sentences without any thought of the subject and predicate of a sentence, and use the different parts of speech without any knowledge of them as parts of speech. He should use nouns and verbs without knowing that they are nouns and verbs; form plurals without any rules for numbers; use cases, modes, tenses, etc., without knowing that there are such things as cases, modes, tenses, etc.

The system of language lessons aims to teach the use of language by imitation and practice rather than by the study of rules and definitions. The object is to give children a knowledge of the uses of words and the power to express their ideas, without clogging their memories with grammatical terms which are to them often only abstract sounds without any content of meaning. The pupils are brought into contact with living language, and not the dead dry skeleton of grammatical definitions and rules; and this living spirit becomes engrafted on their own language until it becomes a part of their nature.

According to this principle, a knowledge of language should precede a knowledge of grammar. This is the historical order of development. The ancients knew language and could use it in literature, but they had very little knowledge of grammar. Homer sang in immortal verse, and probably hardly knew a noun from a verb. The Iliad embodied the rules of grammar, without the author being conscious of them; the rules of grammar were derived from the study of the Iliad. This is also the natural order,—practice precedes theory, the art comes before the science,—and should be followed in the early lessons on language.

Another principle is that language lessons should lead to and be the basis of grammatical instruction. Most of our text-books on language lessons invert this order by basing the lessons in language on grammar. This is a very great mistake, and vitiates the whole course of instruction. The language lessons should prepare for and lead up to grammar. Grammar may then return the favor and aid in the correct use of language. Thus art gives birth to science, and science reciprocates the favor and gives perfection to art. The study of grammar, therefore, should not be begun until such a course in language lessons, as is suggested, has been completed.

Such lessons should be begun as soon as the child can write. Before this it should be required to commit and recite little poems and pieces of prose. If it can hear good models of conversation, it will be of very great advantage in the culture of correct expression.

Course of Lessons.—We shall now present an outline for a course of Language Lessons suitable for beginners. This is a mere outline and is to be filled out by the teacher in actual instruction.

1. Require pupils to write the *names of objects*. Write the names of ten objects; the names of objects in the school-room; objects in the house; objects they can see by looking out of the window; objects they saw in coming to school, etc.

2. Require pupils to write the *names of actions.* Write the actions of a child; of a bird; of a dog; of a cat; of a fish; of a horse; of a cow; of a cloud; of a river, etc.

3. Require pupils to write the names of objects with the names of actions, forming a sentence. Give the name of the object, requiring them to give the name of the action; also give them the name of the action, requiring them to give the name of the object.

4. Lead pupils to an idea of a sentence, as asserting something of something. Lead them to see what is a *telling* or *declarative* sentence, an *asking* or *interrogative* sentence, and a *commanding* or *imperative* sentence.

5. Teach them that each sentence begins with a *capital letter;* that a declarative or imperative sentence ends with a *period*, and an interrogative sentence with an *interrogation* point. Drill them in writing sentences and correcting sentences which violate these rules.

6. Have them write sentences introducing *adjectives*, *adverbs*, *pronouns*, *interjections*, etc. The teacher will *give the word*, and have them form the sentences. Of course the pupils are not to know anything about these words as *parts of speech*.

7. Show the difference between *particular* and *common names*, and teach the use of *capitals* for particular names. Teach also the use of capitals for I and O. Have them write exercises involving these things, and correct sentences which violate their correct use.

8. Give *two words*, and have pupils write sentences containing them both; give also *three words* to be put in a sentence, *four words*, etc. The pupils may also be allowed to *select the words* which they are to unite in a sentence.

9. Give pupils sentences, with *words omitted*, and require them *to insert* the correct words. Such sentences can be dictated to them, the missing word being indicated by the word "blank." If they are written upon the board for them, the

missing words may be indicated by a *dash;* as, "I saw a —— building a —— in a tree." The teacher should select and prepare a large list of such sentences for the use of his pupils.

10. Have the pupils *look at an object* and describe it. Have them describe a school-mate, a horse, a cow, a cat, a pig, the school-house, a barn, a church, etc. A very interesting exercise can be had in describing one another, and other persons whom they know.

11. Have pupils *look at a picture*, and tell you all they see in it, and then write it out on their slates or on paper. Pictures can be found in the primary readers, or the teacher may bring a large picture to school for the pupils to look at, or pupils may bring some pictures from home.

12. Show them how to arrange *lines of poetry*, and that *each line begins* with a *capital letter.* Dictate poetry to them, and have them copy it, getting the lines and the capitals right. After pupils are familiar with correct forms, they may be allowed to criticise incorrect forms; as

Mary had A little Lamb.
its Fleece was wight As snow !
and Every Where that marry Went ?
The Lamb ; was shure To go :

13. Have pupils *talk about something*, and then *write down what they have said* about it. Let them learn to *write their talk.* Take such subjects as a *knife*, a *chair*, a *boat*, a *pin*, a *needle*, a *cat*, etc. Parts of the body, as the *eyes*, the *nose*, the *mouth*, the *tongue*, the *hands*, the *feet*, etc., are easy and interesting subjects for children to talk and write about.

14. Call out a child's knowledge of an object by *asking questions* about it, and then have him write down what has been said, in distinct sentences. Children often know more about an object than they can think of. Questions will also lead them to discover new things about the object that they had not noticed before, and teach them how to look at things and gain a knowledge of them.

15. *Talk to the children* about something, have them *repeat what you have said* in their own words, and then *write it out* on their slates, or on paper. They will thus see that *writing a composition* is *merely telling in writing* what they know and can tell in talk.

16. Teach them the use of the *hyphen*, as connecting compound words; and also its use at the end of a line, in connecting one syllable with the syllable beginning the next line.

17. Teach the use of the *comma*, as placed *after the name addressed;* as, "John, come here;" and also as *connecting three words* of a series; as, "He saw a boy, a girl, and a dog."

18. Teach the use of the *period after abbreviations;* and make pupils familiar with the common abbreviations; as, Mr., Dr., Rev., Hon., Esq. Drill them on LL.D., so that they will not make the common mistake, "L. L. D."

19. Teach the use of *quotation marks.* Show that the informal quotation is set off by the comma; as, Mary said, "John, come here." Show also that a divided quotation has two commas; as, "To be good," says some one, "is to be happy."

20. Teach also the use of the *colon before a quotation* introduced formally by such expressions as "the following," "as follows;" as, He spoke as follows: "Mr. President, the gentleman is mistaken in his facts," etc.

21. Teach the use of the *apostrophe* in denoting possession; as, John's book. Also, its use in denoting *omission of letters;* as, Ne'er, 'T is, I 've, etc.

22. Teach the use of the *exclamation point* after interjections; as, Oh! Alas! Pshaw! Hurrah! etc.

23. Let the teacher *read a narrative* and *ask questions* on it, and then have the pupils *reproduce it* orally and in writing.

24. Write *sentences on the board*, and have the pupils *imitate them* in other sentences. Write also *faulty sentences* for them to correct. Include errors upon all the things that have been presented in these Language Lessons.

25. Give *related simple sentences*, and require pupils to *unite them* into compound sentences. Thus, "John stood up;" "John spoke to his father," changed into "John stood up and spoke to his father." Let them also *decompose compound sentences* into simple ones; as "John and Mary went home," changed into "John went home," and "Mary went home."

26. Give them some *little proverb*, and have them write out an explanation of it; as, "Little children should be seen and not heard;" or, "Birds of a feather flock together;" or, "A rolling stone gathers no moss."

27 Require them to *express sentences* in *different ways;* as, "The flowers bloom very sweetly in the spring of the year," changed to "In the spring of the year, the flowers bloom very sweetly."

28. Require them to *change poetry into prose.* Write a stanza on the board, and have them express the same thing in prose; as,

"The day is done, and the darkness
Falls from the wings of Night,
As a feather is wafted downward
From an eagle in his flight,"

Changed to "When the day is done, the darkness falls around us as gently as a feather which falls from the wing of an eagle flying above us."

29. Exercise them on *misused words* and *incorrect constructions;* as, "I *expect* you had a good time;" "Let Mary and *I* go out;" etc. Make a full list of the incorrect expressions in common use, and drill the pupils in their correction.

30. Present the elements of *Letter Writing.* Teach the correct form of the Date, Address, Introduction, Close, Superscription, their punctuation, and the correct use of the capitals which occur in them. The teacher who does not understand the subject will find it explained in Westlake's *How to Write Letters.*

31. Require pupils to *write letters of different kinds;* as

Business Letters, Notes of Invitation, Notes of Acceptance, Excuses for Absence from School, Receipts for Money, Due Bills, Notes, etc.

32. Have them write a letter to a teacher, to a friend, to their father, to their mother, to a school-mate, etc. They will be interested in writing a letter to a dog, or a horse, or a bird, etc., imagining that the animals can understand them. Give them forms of letters as models for them to imitate.

33. Teach them a few of the simple *figures of rhetoric*, as the *Simile*, the *Metaphor*, *Personification*, etc.; and require them to point them out in sentences and to form sentences containing such figures. Have them change metaphors into similes, and similes into metaphors, etc.

34. Have them write little newspaper paragraphs, as an account of a fire, of a party, of a runaway, of a railroad accident, etc. Bring a newspaper into school and read such items of news as will interest them, and have them write little items in imitation of those in the paper.

35. During all this time, have them *committing* and *reciting choice selections* of prose and poetry. Do not allow them to repeat these mechanically without understanding their meaning, but ask questions to lead to a clear idea of what is expressed. This will cultivate a literary taste, which lies at the basis of all artistic excellence in the use of language.

36. Give them suitable subjects and require them to write little compositions. Let the subjects be simple, and of personal interest to them. Indicate the method of treatment. Ask questions to lead them to what should be written. Encourage the timid and diffident. Suggest how to state facts, to say bright little things, to express ideas and sentiments, etc. Lead them to write naturally, expressing what they think and feel. Correct kindly and gently, and strive to make them love to write compositions.

The above presents a very complete outline for instruction in Language Lessons. It is, however, merely an outline, and needs to be filled out for actual use in the school-room. The teacher should take this outline and write out a list of examples or exercises under each head, suitable for the use of his pupils. No text-book in the hands of the pupils is needed for this work, if the teacher is properly qualified himself; but each teacher will find it of advantage to write out a little text-book for his own use in giving instruction in language lessons. To aid the teacher in preparing these lessons, we recommend the following works: Hadley's *Lessons on Language*, Lloyd's *Literature for Little Folks*, Bigsby's *Elements of the English Language*, and Swinton's *Language Lessons*.

In following this outline, the teacher should make the exercises *very full* and *complete*. Do not be afraid of having too much under each head, for we are most liable to err by not giving practice enough. Let the motto be *Make haste slowly*. Give variety to the lessons, and pupils may be kept for a long time on each exercise suggested. Keep up a constant review by introducing parts of the previous exercises into each subsequent exercise.

III. The Writing of a Composition.

We shall now speak of teaching a pupil to write a composition. The previous exercises have been designed for beginners, and are mainly imitative in their character; older pupils should depend more upon themselves, and be required to construct formal compositions. We shall speak of the subject under three heads: first, the Principles to guide a teacher in the instruction; second, the Method of Writing a Composition; and third, some General Suggestions on the subject.

I. Principles of Composition Writing.—In teaching pupils to write a composition, the following principles should be borne prominently in mind:

1. *Composition is to be regarded as the expression of what a child actually knows.* The importance of this principle is

enhanced by the fact that it has been very generally ignored by teachers. Many pupils go to work at their compositions as if they were expected to tell what they do not know. The exercise is not a spontaneous production of what they think, but a reaching out and striving after that which they have never thought. This will account, to a large extent, for the general distaste for composition writing, and the frequent deception in respect to their authorship. Teachers, in assigning subjects, seem to have been oblivious of this principle, often giving subjects that are entirely beyond the reach of the pupil's experience and range of thought.

2. *Pupils should begin with oral compositions.* They should be required to talk about objects before writing about them. We should begin by having pupils *talk compositions* before they *write compositions.* Subjects can be assigned the same as for a written composition, time being given for preparation or not, as the teacher may prefer. Many of our eminent editors and literary men talk their literary productions, and have them copied by an amanuensis.

3. *Pupils should be led to see that writing a composition is writing their talk.* This is the key to composition writing with young pupils. This principle clearly understood, would be like a revelation to many a pupil; it would open up the way and remove the difficulties that so often seem to rise up mountain high before them. Many persons who talk well seem to grow dumb when they take a pen in hand; what they need to learn is to write their talk.

4. *Do not be too critical at first.* Severe criticism tends to discourage the pupil, and create a distaste for the subject. There is no exercise in which criticism wounds so deeply or discourages so soon as that of composition writing. Pupils need encouragement as well as direction. We should commend that which is worthy of praise; and, in a kindly manner, point out the mistakes and suggest where improvements can be made.

5. *Make the subject interesting.* Cultivate a love for the expression of thought. Be an inspiration to pupils by writing for them and with them. Start a little newspaper in the school, and have them contribute to its columns. Make them feel that composition writing is a delightful task; the most delightful exercise in the school. They will thus long for "composition day," instead of regarding it with dread or indifference. Remembering these principles, the teacher's way in teaching composition will be much smoother than it has been, and the results will be much more satisfactory. Indeed, the teacher who catches the spirit of these principles, and applies them properly, can make the pathway all bright and fragrant with blossoms of interest, both for himself and for his pupils. Some of the author's pleasantest recollections of school life are associated with his classes in composition.

II. WRITING A COMPOSITION.—In the writing of a composition, there are four things which call for special attention: 1. *The Subject;* 2. *The Matter;* 3. *The Analysis;* 4. *The Amplification.*

Each of these is modified by the kind of composition to be written. The principal kinds of composition are as follows: 1. Description; 2. Narratives; 3. Essays; 4. Discourses; 5. Fictions; 6. Poems. The first and second of these consist mainly of a description of facts. The Essay is a presentation of thought or opinion upon some subject: in a large sense it may include Editorials, Reviews, and Treatises. Discourses are productions designed to be read or delivered: they include Lectures, Sermons, Addresses, and Orations. Discourses usually contain both thought and description.

The Subject.—The Subject of a composition is one of the most important parts of the production. To select or invent a good subject often requires more thought and talent than to write the composition. The merit of a literary production often depends very largely on the selection of a happy and suggestive topic.

It is usually best for the teacher to assign the subject to the pupil. He can better adapt it to the taste and capacity of the pupil than the pupil can himself. Besides, the pupil may not only select an inappropriate subject, but will often spend more time in making the selection than in writing upon it. It also secures more variety in subjects for the teacher to select them, and thus gives a wider culture in writing. It also removes, to a great extent, the temptation to plagiarize, as the pupils cannot so readily find access to an article on a given topic as when they choose the topic. At times, however, pupils should be required to select and invent topics for themselves, as it is an excellent exercise for their ingenuity, and tends to cultivate independence and self-reliance of thought. Pupils who have always depended on the teacher for subjects, become very helpless when placed in circumstances where they must make their own selection.

In assigning the subject, the teacher should be careful to adapt it to the pupil. Do not give abstract or lofty subjects about which the pupils have no ideas or knowledge. What, for instance, does a little child know about *Contentment*, or *Immortality*, or *Government*, or *The Sublimity of Thought*, etc.? Let the subject be one that appeals to the pupil's experience. For young pupils, subjects like *going to school, swimming, fishing, skating, coasting,* etc., would be appropriate; older pupils should write on subjects requiring more maturity of thought and experience. In all cases, let the subject be interesting to the writer, if possible, and one upon which he may express what he really knows.

Subjects should be so varied as to give practice in various styles of composition Pupils should be required to write descriptions of objects, places, persons, natural scenery, etc.; they should be required to relate incidents of their observation or experience; to write little fictions, allegories, orations. dialogues, etc.; and, with many pupils, an exercise in writing poetry will also be of real value.

The subject must also be determined by the kind of composition to be written. If the composition is designed for a public audience, it should be of popular interest and suited to the intelligence of the audience.

The subject should possess unity, and be clear and fresh. The statement of it should be simple, not too figurative, but happy in expression, and, if possible, striking. The manner of stating a subject often gives popularity to a production. A book frequently owes a large share of its popularity to its title. The title, *That Husband of Mine*, sold many more copies than the story itself merited, and became a model for the naming of a score of other works.

The Material.—When the subject is selected, the first thing is to acquire the *material* for the production. There must be something to say before we attempt to say anything. We cannot draw water from a dry well. This getting the material is called *Invention;* and it is the most difficult part of the process of composing. It is not easy to show how it can be done. Some hold that it is not a thing to be taught, that "it is a part of one's native endowment," an original talent and not a power to be acquired. A few suggestions can be made, however, which are thought to be valuable.

The material of a composition consists of facts and thoughts. Facts embrace such things as have been observed by the writer or by others. The thoughts embrace opinions, sentiments, figures of rhetoric, etc. This material may be obtained from at least five different sources; Observation, Conversation, Reading, Imagination, and Reflection. These are treated quite fully under Preparation for Composition Writing, and need not be discussed here. They are more or less prominent in supplying the material, according to the character of the subject upon which one is writing.

Observation.—If the subject is descriptive or narrative, a writer should draw first from his own observation. That which is stamped with a writer's personality, is far more interesting than what he gives at second hand. Some one happily remarks, "Do not go to Homer for a sunrise when you can see one every morning." In the second place, the writer should draw from the experience of others, which may be done by conversation or by reading. Much can be picked up in conversation that will be fresh and interesting. In the use of books, select only those things that are most attractive, and endeavor to express these facts in your own language. When the material derived from these several sources is abundant, make use of that which seems to possess the most novelty.

Imagination.—Try to throw the light of fancy around this material. The plain fact is not of so much interest as when it is made to glow with the touch of imagination. Let the fact awaken an image in the mind, if possible; draw from it a simile or a metaphor; endue it with the life of a personification, etc. Many writers, like Scott and Dickens, weave the most beautiful fancies into their statements of facts and cast a charm over the descriptions of the most familiar objects.

Reflection.—If the subject is reflective in its character, the material will consist principally of thoughts and opinions. These thoughts and opinions are attained by thinking, by reading, and by conversation. A writer should first try to think out all he can for himself. And here the question arises, how shall we evolve or create thoughts by thinking? No rule can be given, but a few suggestions will be ventured.

First, we should put ourselves in a reflective mood; we should fix the mind on the subject and think about it. Newton said he made his great discoveries by continually thinking about them. We should surround the subject of thought with questions. Asking questions is one of the doors to all great discoveries in science or inventions in art. We should try to answer our own questions. This will give activity to our thoughts, and afford us something to say on the subject. Thus, if the subject is, "The Stars," we may inquire,—What are stars? Whence do they come? Why do they shine at night? Why do they twinkle? With what have they been compared? etc The answering of these questions will give a large amount of material for a composition on "The Stars."

Many subjects should be developed around some leading thought, and we should endeavor to find this leading thought, which gives unity to the treatment. The leading thought of a discourse is the germ from which it is developed. It is the living principle from which it grows; the parent idea which becomes the source of its life and growth, and without which the words will be but a dead letter. When the germ-thought appears in the mind, let the understanding brood over it, and it will develop into a living organism of thought and expression. This leading thought once in the mind, will give rise to many other thoughts connected with it, and which grow out of it as the branches shoot forth from the main stem of a tree. If this general conception does not occur at first, fix the mind on the ideas that do occur, compare them and see what principal thought they suggest or lead to, and thus reach the germinal principle of the composition, going from the parts to the whole.

It is proper also to think out some figures of rhetoric, some comparisons, similes, or metaphors to be used in the amplification of the material. Many such thoughts will occur to us in writing, and they are usually most appropriate when thus suggested; but some of our best writers mark down their happy thoughts to be worked into their productions as they are needed.

Reading.—The writer may also read books written upon or touching upon the subject. Some of these ideas may be taken and used as presented, by giving credit to their author. Many of the thoughts can be worked up into new forms, so that they will be, in a certain sense, one's own property. Such an exercise will be of great value to a young writer, in teaching him how to think. In reading, however, one should digest and assimilate what he reads, so that it will appear with the stamp of his own mind upon it. It will then become his own property and can be used at his will.

Another suggestion in obtaining the material by reading, is to read authors who have written on the subject or a kindred one, and mark down the ideas which their thoughts suggest to the mind. Many authors are very suggestive of ideas. They seem to deal in seed-thoughts which fall into the mind and produce other thoughts in abundance. As we read, an idea seems to spring up in the mind by a sudden illumination, as the spark darts from the flint when struck by the steel. Thus Emerson and Carlyle can be most profitably read with a pencil in the hand, marking down the ideas which spring up in the mind as the eye passes over the printed page.

The facts of biography, history, etc., should be rallied around the leading ideas to support or prove the position taken. These facts may be culled out from the store-house of memory, or we may go to books and gather the material needed for illustration or proof. It is well for the student to have a "commonplace book," and mark down such incidents and historic statements as he thinks may be of use to him in writing.

Collect Material.—This material should be written down on paper, as it presents itself to the mind. It is well to have a blank book and jot down the thoughts as they may occur to us, without respect to any particular order. This can be done at odd times as the thoughts present themselves, so that when the time comes to write composition, there will be a fund of material to make use of.

The Analysis.—The material having been acquired, the pupil should examine it, see what is most interesting or most pertinent to the subject, bring together those parts that are similar, and make a complete outline of the method and order of treatment. This is called forming the plan, or the *Analysis;* and is an important part of the composition. As a rule, it should never be omitted; the pupil should always have some general idea of the composition before he begins to write. In a kind of fancy writing, we may give free rein to thought and imagination, and allow them to play with the ideas that may chance to present themselves. The light and gossipy essays of Addison and Lamb could never have been written from an outline, though even in many of these there is a leading idea that gave shape to the production. It is an excellent exercise for the pupil to take different subjects and merely prepare outlines of their treatment.

In forming the analysis, the composer should have in his mind an idea of what he wants to present. If the object is description, he should see clearly the order in which the facts should be stated to secure the interest of the narrative. If the production is reflective, he should know what he desires to prove or to impress, and arrange the points in such a way as best to secure this object. Care should be taken that there be no abrupt breaks between the parts, but that one part flows naturally out of and into another. It will be well sometimes to try different arrangements, and see which seems best. A writer will often change the whole plan of his essay while he is writing it out, as a general changes his plan of attack on the field of battle; but this is always inconvenient and hazardous. A very great deal of good judgment may be shown in the analysis of subjects, and the success of a lecture or address is often largely due to the arrangement of its parts.

The Amplification.—Having formed the plan of the composition, the next step is the *Amplification*. The facts and thoughts are to be presented in an orderly manner; care is to be taken that the sentences are clear and correct, that the matter is properly connected, that the style is suited to the subject, etc. Many new ideas and illustrations will present themselves in the course of the amplification; and when appropriate should be wrought into the composition.

There are three parts of a literary production that require especial attention. These are the *Introduction*, the *Body*, and the *Close.* In an ordinary short school essay, these divisions are not so marked; and yet they are not to be overlooked even there. Every production should have a fitting opening and closing thought; it should neither open nor close with an awkward abruptness. In lengthy essays, lectures, orations, etc., these divisions should be distinctly marked.

The Introduction—The Introduction should be modest, appropriate, lively, and interesting. It should not promise too much, or the expectations it raises may be disappointed. It should grow naturally out of the subject, and be a natural introduction to what is to follow. It should be suited to attract notice, and to prepare the mind to listen with attention and an expectation of pleasure to what follows. An interesting incident, an apt illustration, a humorous remark, etc., are often used by good writers and speakers as an introduction. In an oration, the introduction should have an air of candor and modesty; it should be calm and moderate, and not anticipate the main points of the discussion.

Cicero laid down the rule that the Introduction should be written last, though he did not always follow his own precept. He was accustomed to prepare introductions and lay them aside to be used when needed. On one occasion, he inadvertently used the same introduction twice; and upon being informed of it by Atticus, he confessed his error, and prepared a new one.

The Body.—In the Body of the essay, the subject should be formally developed. The leading idea should be kept carefully in mind, and the effort be made to unfold it. There should be an organized growth of thought and expression in which all the subordinate ideas are gathered around the principal one. A thread of related thought should run unbroken through the entire exposition, binding all the parts together in symmetry and unity.

In view of this, the different points to be presented should be arranged in the best order. If there are objections to be answered, it is usually best to attend to them first. Having cleared the way of these, the direct arguments may then be presented, throwing the less plausible ones in the middle, and thus giving the stronger ones first and last. The exhortation and appeal to the feelings come appropriately toward the close, but an incidental appeal may be made at different times as the occasion offers.

If humorous passages occur in a spoken discourse, they should not come in too near the beginning, or they will unfit the minds of the hearers to listen to what follows. So also it is not well to touch the feelings with pathos near the early part of the discourse, for it will be difficult to hold the interest after the reaction of feeling takes place. It is well also that the production should increase in majesty and grandeur of expression towards its close.

Care should be taken that the thoughts be expressed in an attractive and pleasing form. The language should be simple, clear, and impressive. When suitable, it may be adorned with figures of rhetoric and pictures of the imagination. Nothing should be introduced, however, for mere ornament, and that does not contribute to the main purpose of the essay. Much self-denial is often required to avoid putting words or figures into a production when their only claim is their beauty. It is in this that the difference between a cultivated and an uncultivated writer is readily noticed.

The Conclusion.—The Conclusion, or Peroration of a discourse, like the Introduction, requires especial care. The object is to leave as deep an impression on the mind of the reader or listener as possible. This is sometimes done by reserving the strongest or most impressive head of the discourse for the last, and ending with it. Sometimes the writer or speaker gives a brief and striking summary of the whole discourse, bringing it all, in rapid succession, again before the mind. In this way the conclusion becomes a kind of burning-glass which gathers into a focal point all the separate rays of the production.

The conclusion may often consist of an exhortation or appeal to the feelings, in view of what had been stated. Accepting the views of the writer or speaker, the reader or listener is prepared to sympathize with his feelings and to share in his emotions. In every case, where there is a formal conclusion, it should seem to flow naturally out of the discussion and be appropriate to it and the subject.

Dr. Hart says, "The main thing to be observed is to hit upon the precise time for bringing the discourse to a point. If this is done too abruptly, it leaves the hearers expectant and dissatisfied. If, when the discourse seems ended, and the hearers are looking for the close, the speaker continues turning round and round the point, without coming to a pause, the audience becomes restless and tired. There are, indeed, very few speakers that know how or when to stop."

In this discussion of composition writing, we have lifted the subject up into the plane of preparing a lecture or an oration; but it will be seen that the suggestions given nearly all apply to the writing of an ordinary school composition. A composition, if thoughtful, is a little lecture or a little oration, and is designed to prepare for these larger productions; and the same methods and principles that apply to one apply also to the other, the difference being one of degree only. We close the subject with a few general suggestions.

III. General Suggestions.—There should be frequent exercises in writing composition. In many schools pupils are required to write once in two weeks. It would be better, however, to have them write every week; and still better to have the exercise more frequently.

Paper, Writing, etc.—The pupils should be required to write on paper of a uniform size. The large-sized letter-paper, known as "Bath post," is perhaps the most convenient. The subject should be written at the top of the page on the middle of the first line; and a blank line left between the heading and the composition. There should be a margin of about one inch on the left-hand side of each page, to allow room for corrections. The first line of each paragraph should be indented about one inch. The writing should be neat and legible, with no flourishing or fancy writing; and care should be taken with respect to the paragraphs, etc. The signature should be written on the next line below the close of the composition, near the right-hand edge; and the name of the place and date on the next line below the signature, near the left-hand edge. The compositions should all be folded alike, in three divisions; and the name of the writer, the subject, and the date, be written on the back. If an outline is required, it may be written either at the beginning or close of the composition.

Corrections.—The compositions should be handed in promptly at the time appointed, for correction. The corrections, as a rule, should be made by the teacher; though at times the essays may be distributed among the members of the class for correction, under the general supervision, however, of the teacher. The corrections may include errors in orthography, punctuation, use of capitals, hyphens and apostrophes, construction of sentences, figures of rhetoric, style of expression, general development of the subject, etc. The closeness of the correction should be adapted to the age and ability of the pupils. Severe criticism will tend to discourage young pupils, who are especially sensitive in respect to their own compositions.

It will be best for the teacher, as a rule, to indicate the errors, rather than to correct them, requiring the pupils to make the correction. This will make a deeper impression upon the mind than when the teacher makes the corrections for them, and will lead them to be more careful not to repeat the mistake. In order to indicate the errors, some system of notation should be used. A line may be drawn under each error, and the symbol indicating the nature of it be written in the margin. The notation used in our own school, is as follows: *A* for analysis; *O*, orthography; *G*, grammar; *W*, wrong word; *S*, sentence; *P*, punctuation; etc. For a fuller statement of the system, see Westlake's *Three Thousand Practice Words.*

The teacher may sometimes take the compositions into the class and call attention to the errors, withholding the name of the writer, if he chooses, and invite corrections and suggestions. The pupils may also be required to read the errors marked, and correct them orally, or write them upon the board with their correction. Some teachers require pupils to copy the composition in a book provided for the purpose, with the mistakes all corrected.

Reading Compositions.—There should be a time set apart for the reading of compositions. This is a very useful exercise, and may be made the means of a great deal of literary culture. In this exercise, each pupil may read his own production, or one may read for another, as the pupils or teacher may prefer. After the reading of a composition, remarks and criticisms may be made, first by the pupil and then by the teacher. Care should be taken that the attitude, expression, etc., of the reader be free from error. Pupils may often be required to commit their essays and recite or declaim them, those designed for declamation being written in the style of an oration.

The exercises of "composition day" may be made very interesting and instructive by varied literary exercises. A paper, with an appropriate name, to which the pupils contribute, will give variety to their productions and be of great interest to the pupils. It may contain short essays, editorials, items of news, amusing incidents, wit, humor, poetry, advertisements, etc. Some orations, recitations, dialogues, and debates will also give additional interest to the occasion. The class may occasionally be resolved into a literary society with regular officers and a programme of exercises, consisting of an inaugural address, orations, recitations, essays, answers to referred questions, a paper, etc.

In conclusion, we remark that the teacher should spare no pains to create an interest in literary culture. No greater intellectual benefit can be conferred upon a pupil than to cultivate in him a literary taste and train him to an appreciation of literary productions. That teacher achieves a great success and accomplishes a valuable work, who makes composition writing a pleasing task and composition day to be regarded with interest and delight.

MATHEMATICS.

CHAPTER I.

THE NATURE OF MATHEMATICS.

MATHEMATICS is the science of Quantity. It seeks to ascertain the relations and truths of quantity, and to derive unknown quantities from other quantities that are known. This definition indicates the general nature of the subject, though it is not entirely free from objections. Many attempts have been made to frame a philosophical definition of mathematics, but none has yet been presented which is generally acceptable.

The term Mathematics is derived from the Latin *mathematica*, or the Greek *mathematike*, which comes from *mathesis*, learning. The use of the word in the plural form indicates that this department of knowledge was formerly considered not as a single branch, but as a group of several branches, similar to our use of the phrase, the *mathematical sciences.* Previous to the present century, nouns ending in *ics*, as *optics*, *mechanics*, etc., were construed with a verb in the plural; but they are now generally regarded as singular.

The fundamental branches of mathematics are Arithmetic and Geometry. This classification arises from the nature of the two kinds of quantity considered. The two general divisions of quantity are Number and Extension: the science of number is Arithmetic; the science of extension is Geometry. These two branches have also been distinguished with respect to their relation to Time and Space. Extension has its origin in Space, and number in Succession, which is only possible in Time. Hence, Geometry has been called the science of Space, and Arithmetic the science of Time. Geometry has also been called the science of Form, since it treats of the possible forms of space.

If we introduce general symbols for numbers, and develop a science with them, we have another branch of mathematics, called *Algebra*. If we use these general symbols in investigating geometrical magnitudes, we obtain another branch called *Analytical Geometry*. If we investigate quantity by considering the infinitesimal elements of which it is composed, we obtain a branch called *Differential* and *Integral Calculus*.

There is another method of conceiving the subject of quantity and reaching a division of the science. Quantity is of two kinds; *discrete* and *continuous*. Discrete quantity is that which exists in separate parts, forming quantity of multitude or number; as a number of men, trees, etc. Continuous quantity is that which does not exist in separate parts, or is that in which the parts are connected together in one whole, as length, time, etc. Discrete quantity is immediately expressed in numbers, and gives rise to the science of arithmetic. Continuous quantity cannot be immediately expressed in numbers; a part of the quantity must be taken as a unit of measure in order to express it numerically. One form of continuous quantity, that which belongs to space, gives rise to the science of geometry.

There is no general agreement among writers in respect to the philosophical division of the science of mathematics. Comte, the most celebrated writer on the philosophy of mathematics, divides the science into two parts; Concrete Mathematics and Abstract Mathematics. Under Concrete Mathematics he includes Geometry and Rational Mechanics; under Abstract Mathematics he includes the Calculus, which embraces Arithmetic, or the Calculus of Values, and Algebra, or the Calculus of Functions. The latter, called also *Analysis*, embraces ordinary algebra, in which the equations are *directly* established between the magnitudes under consideration, and the Transcendental Analysis, in which the desired equations are derived by invariable analytic methods from equations between quantities *indirectly* connected with those of the problem. These are distinguished as the *Calculus of Direct Functions* and the *Calculus of Indirect Functions.*

Materials.—A knowledge of mathematics consists of *Ideas* and *Truths.* The Ideas of mathematics represent the different forms of quantity which present themselves for consideration. The Truths of mathematics are the relations that exist between the quantities. When we conceive and examine the different forms of quantity, we perceive some truths that are self-evident; such truths are called *axioms.* By means of these axioms we compare the different quantities, and attain to other truths; these truths are said to be derived by reasoning. The ideas and axioms are thus the basis upon which, by the process of reasoning, we build up the science of mathematics.

The Ideas.—The Ideas of mathematics are not merely ideas or products of the mind. They represent realities, things which have an objective existence. They are not ideas of material things, there is no tangible reality corresponding to them, but they are real forms of space and number. The forms of geometry are pure forms, forms not filled with content; and the numbers of arithmetic are pure numbers, independent of any association with material things. But in both cases the quantities are realities which admit of application to the objects of the material world.

Definitions.—The description of the ideas of mathematics in clear and exact language gives rise to the *Definitions* of the science. The Definitions of mathematics may thus be regarded as the precise description of its ideas. The ideas are antecedent to the definitions, and are the basis of them. In teaching the science, definitions are employed to lead the mind of the learner to clear conceptions of the ideas. On account of the intimate relation between the idea and the definition, some writers state that the foundation of mathematics is definitions and axioms, rather than ideas and axioms.

Axioms.—The Axioms of mathematics are the self-evident truths of the science. They are intuitive truths which arise in the mind immediately on the contemplation of the various forms of quantity, without any process of reasoning. They express a self-evident and necessary relation between quantities, and thus involve a comparison or a judgment. Given the several conceptions, and the truth is immediately perceived by a direct comparison, without any intervening process of thought.

Axioms are the basis of mathematical reasoning. Without some self-evident truths as a starting point, no process in thought is possible. By some they are regarded as general truths which contain the particular truths of the science, and from which the particular truths are evolved by reasoning. It seems more correct, however, to regard them as laws which direct or govern the comparisons of the reasoning process. Thus the truth that "things that are equal to the same thing are equal to one another," is a law to guide us in comparing quantities, rather than a general truth that contains the other truths of mathematics.

Reasoning.—The Reasoning of mathematics is *deductive.* It deals with necessary truth, and derives the relations by universal and necessary laws of inference. The basis of the reasoning is the definitions and axioms, or in other words, the conceptions and the self-evident truths arising out of these conceptions. Thus having a conception of a *triangle* and a *right angle*, we may by comparison, in accordance with the laws of inference, derive the truth that "the sum of the angles of a triangle equals two right angles." So in arithmetic, having a conception of some subject, as the *greatest common divisor*, we can derive a method of obtaining the greatest common divisor of two numbers, guiding the investigation by the self-evident truths that pertain to the subject

Value of Mathematics.—Mathematical studies have in all ages been valued for the mental discipline they afford. There is probably no single study pursued in the schools which develops the mind in so many ways, and is so well adapted to every stage of mental growth as mathematics. Mathematical studies give some culture to perception and memory, faculties which it has been thought they almost entirely neglect. They require the most complete mental concentration, and thus afford the highest culture to attention. Dealing with the relations of quantity, they give constant exercise to the judgment, and train it to the closest discrimination of similarity and differences. Every derived truth is a logical deduction from premises, and is reached by the continued operation of the power of reasoning. The first truths are axiomatic, and are comprehended only in an act of intuition, which gives exercise to the Reason.

The Imagination is also active in geometry in picturing the parts of the figures upon which we reason, and in creating diagrams to discover new relations. All the definitions are "logical definitions," and as such train to the nicest perception of the relation between ideas and their expression. In fact there is no one science that brings so large a number of the faculties of the mind into so constant and forcible an activity, and especially those faculties which give strength and dignity to the intellect, and glory to scientific achievement. That it does not train to habits of *probable reasoning*, and does not give facts for induction and for opinions on social and political questions, is admitted; but that it does more than any other school study to give mental power and logical habits of thought, must also be admitted.

Elementary Branches.—The three elementary branches of mathematics are *Arithmetic*, *Algebra*, and *Geometry*. These are taught in all our graded and high schools, and should, in their elements at least, be taught in the ordinary common schools. We shall in this work discuss the methods of teaching these three branches.

CHAPTER II.

THE NATURE OF ARITHMETIC.

THE science of arithmetic is one of the purest products of human thought. It was aided in its growth by the rarest minds of antiquity, and enriched by the thought of the profoundest thinkers. Over it Pythagoras mused with the deepest enthusiasm; to it Plato gave the aid of his refined speculations; and in unfolding some of its truths Aristotle employed his peerless genius. In its processes and principles shines the thought of the ancient and modern world; the subtle mind of the Hindoo, the classic culture of the Greek, and the practical spirit of the Italian and Englishman. It comes to us adorned with the offerings of a thousand intellects, and sparkling with gems of thought received from the great minds of nearly every age.

Like all science, which is an organic unity of truths and principles, the science of arithmetic has its fundamental ideas, out of which arise subordinate ones, which themselves give rise to others contained in them, and all so related as to give symmetry and proportion to the whole. These fundamental and derivative ideas, the law of their evolution, and the philosophical thread that runs through them and binds the parts together into an organic unity, should be understood by the teacher.

To aid the teacher in acquiring a more philosophic conception of arithmetic than he obtains from the text-book, we shall speak of the General Nature of the science, its Language, Reasoning, and Methods of Treatment. We shall then proceed to consider the Methods of Teaching the subject.

I. The General Nature of Arithmetic.

Definition.—Arithmetic is the science of numbers and the art of computing with them. The term is derived from *arithmetike*, which is from *arithmos*, meaning number. This is the definition usually given, and is sufficiently correct for all practical purposes. There are some writers, however, who hold that Arithmetic is only one of the sciences of numbers, Algebra and Calculus being also regarded as sciences of number Some French writers call the general science of numbers *Numerique;* and divide it into Arithmetic, the science of special numbers, and Algebra, the science of number in general. Sir Isaac Newton called algebra *Universal Arithmetic.*

The Nature of Number.—The basis of arithmetic is Number. A number is usually defined as a unit or a collection of units, a definition derived from Euclid. This definition is liable to the objection that a *number* and a *collection* are not quite identical in meaning. Many definitions of a Number have been attempted, but none has yet been given which is entirely satisfactory to mathematicians. The simple idea of a number is that it is the *how-many* of a collection of objects, and it might be so defined. The definition first given is, however, the one generally preferred by writers on arithmetic.

There are three fundamental classes of numbers; *Integers*, *Fractions*, and *Denominate Numbers.* These three classes are practically and philosophically distinguished, and constitute the basis of a threefold division of the science. Logically the distinction is not entirely without exception, since a fraction may be denominate, and a denominate number may be integral; but the division is regarded as philosophical, since these three classes of numbers not only differ in character, but require distinct methods of treatment, and give rise to distinct rules and processes.

Integers.—An Integer is a number of integral units. These units are regarded as individual or whole, and hence an Integer is called a *whole number.* There is no relation of the things numbered to any other thing regarded as a unit; but simply the relation of the collection to a single thing of the collection. An integer is thus a pure product of synthesis.

Fractions.—The Unit, as the basis of arithmetic, may be multiplied or divided. A synthesis of units, as we have seen, gives rise to Integers; a division of the Unit gives rise to Fractions. Dividing the unit into a number of equal parts, we see that these parts bear a definite relation to the integral unit, and name them from this relation. These parts may be regarded as individual things, and constitute a particular class of units called *fractional units.* The collection and numbering of these fractional units give rise to a particular class of numbers called *Fractions.*

Denominate Numbers.—Quantity is of two kinds—quantity of *multitude* and quantity of *magnitude*—called also *discrete* and *continuous* quantity. Discrete quantity exists in individual units and is immediately estimated as *how many;* continuous quantity exists in the mass, and is primarily estimated as *how much.* Thus we say *how many apples*, *how many trees*, etc., while we say *how much money*, *how much land*, etc. Quantity of magnitude does not primarily admit of numerical expression; to thus express it, we fix upon some definite part of the quantity as a *unit of measure*, and express the quantity by the number of times it contains the unit of measure. Continuous quantity thus becomes expressed as discrete quantity; the *how much* is reduced to the *how many;* and a new class of numbers arises, called *Denominate Numbers.* These units being of different sizes and bearing different relations to one another, require a special method of treatment which gives rise to a distinct department of arithmetic. With the adoption of the metric system, this part of arithmetic will lose the distinctive character of its operations.

Logical Outline of Arithmetic.—The science of Arithmetic is based upon and is developed from these three classes of numbers. Its several parts are evolved from the possible operations upon these numbers. A consideration of these possible operations will give us a *Logical Outline* of Arithmetic.

All numerical ideas begin at the Unit. The Unit is the origin, the basis of arithmetic. The Unit can be multiplied and divided; hence arise Integers and Fractions. Each Integer is a synthetic product derived from a combination of units; each Fraction is an analytic product derived from the division of the unit. Having obtained numbers by a synthesis of units, we may unite two or more numbers, and thus obtain a larger number by means of *synthesis;* or we may reverse the operation and descend to a smaller number by means of *analysis.* Hence the two fundamental operations of arithmetic are Synthesis and Analysis. To determine when and how to unite and separate numbers, we employ a process of reasoning called *comparison.* This process compares numbers and determines their relations; it is the thought process of arithmetic, as analysis and synthesis are the mechanical processes. Comparison directs the original processes of arithmetic, modifies them so as to produce from them new ones, and also itself gives rise to other processes not contained in or growing out of the original ones. Comparison is thus the process by which the science is constructed; it is the key with which the learner unlocks its rich store-house of interest and beauty.

Synthesis.—A general synthesis is called *Addition.* A special case of the synthetic process of addition, in which the numbers added are all equal, is called *Multiplication.* The forming of *Composite Numbers* by a synthesis of *factors*, which we call *Composition*, *Multiples* formed by a synthesis of *particular factors*, and *Involution*, a synthesis of *equal factors*, are all included under Multiplication. Hence the process of Addition includes all the synthetic processes to which numbers can be subjected.

Analysis.—A general analysis, the reverse of Addition, is called *Subtraction.* A special case of Subtraction, in which the same number is successively subtracted with the object of ascertaining how many times it is contained in another, is called *Division.* A special case of Division, in which many or all of the makers or *factors* of a number are required, is called *Factoring;* a special case of Factoring, in which *one* of the several *equal factors* is required, is called *Evolution;* and a case in which some *common factor* is required, is called *Common Divisor.* Hence the process of Subtraction includes all the analytic processes to which numbers can be subjected.

Comparison.—By comparison the general notion of relation is attained, out of which arise several distinct arithmetical processes. By comparing numbers we obtain the idea of *Ratio*, arithmetical and geometrical. A comparison of *equal ratios* gives us *Proportion.* A comparison of numbers differing by a *common ratio* gives us *Arithmetical Progression* and *Geometrical Progression.* In comparing numbers of different units, we observe we may pass from one to another of different species under the same genus, and thus have the process of *Reduction.* In comparing numbers, we may assume some number as a basis of reference, and develop their relations in regard to this basis; when this basis is *a hundred*, we have the process of *Percentage.* In comparing numbers, we discover certain relations and peculiarities which give rise to the *Properties* or *Principles* of numbers.

Remarks.—We thus derive a complete outline of the science of numbers. Arithmetic is seen to consist fundamentally of three things; *Synthesis*, *Analysis*, and *Comparison.* *Synthesis* and *Analysis* are fundamental mechanical operations; *Comparison* is the fundamental thought-process which controls these operations, brings out their potential ideas, and also gives rise to other divisions of the science growing out of itself. The whole science of pure arithmetic is the outgrowth of this triune basis,—Synthesis, Analysis, and Comparison. The rest of arithmetic consists of the solution of problems, either real or theoretical, and may be included under the head of Applications of Arithmetic.

This outline of the science grows out of the idea of pure number, independent of the language of arithmetic. These fundamental processes are modified by the method of notation adopted to express numbers. With the Roman or Greek methods of notation, the methods of operation would not be the same as with the Arabic system. The method of adding by "carrying one for every ten," of subtraction by "borrowing," a portion of the treatment of common and decimal fractions, the methods of extracting roots, etc., are all largely due to the system of notation adopted, and many of them have their origin in the Arabic system. It may be remarked, also, that the power of arithmetic as a calculus depends upon the beautiful and ingenious system of notation adopted to express numbers.

II. The Language of Arithmetic.

The expression of the fundamental ideas of arithmetic gives rise to Arithmetical Language. This language is both oral and written. The oral language is called *Numeration;* the written language is called *Notation.* Numeration is the method of naming numbers and of reading them when expressed in written characters. Notation is the method of expressing numbers in written characters.

Numeration.—In naming numbers we do not give each number an independent name, but proceed upon the principle of naming a few numbers and then forming groups or collections, naming the groups, and using the first names to number the groups. This ingenious, though simple and natural, method of naming numbers by forming groups or classes, seems to have been adopted by all nations. It has the advantage of employing but a few names to express even very large numbers, and of enabling the mind, by the principle of classification, to conceive quite readily of a number otherwise entirely beyond its powers of conception.

Thus, after naming the numbers as far as *ten*, we regard the collection *ten* as a single thing, and count *one and ten*, *two and ten*, etc., up to *twenty;* and then continuing in the same way, we have *two tens and one*, *two tens and two*, etc., up to *three tens;* and so on until we obtain ten of these groups of tens. These ten groups we now bind together by a thread of thought forming a new group which we call a *hundred;* and proceeding from the hundred in the same way, we unite ten of these into a larger group, which we name *thousand*, etc. The names of the numbers immediately following the first group are not quite in the form suggested; but they involve the principle named. Thus, instead of *one and ten*, we say *eleven*, from the Saxon *endlefen*, or Gothic *ainlif* (*ain*, one and *lif*, ten); and instead of *two and ten*, we say *twelve*, from the Saxon *twelif*, or Gothic *tvalif* (*tva*, two, and *lif*, ten). The names of the numbers following these have been modified and abridged by use, though in the present form they suggest the original expression and show the principle of naming numbers.

Origin of Names.—The origin, or primary meaning of the names applied to the first ten numbers, is not known. It has been supposed that the names of the simple numbers were originally derived from some concrete objects, and probably from some part of the person. Many tribes have used the term *hand* to express *five*, and *man* for *twenty*. Humboldt says that the Indians of New Grenada use *ata*, water, for *one; bosa*, an inclosure, for *two; mica*, changeable, for *three;* etc. Prof. Goldstücker gives the following theory for the origin of the Sanskrit numerals, and thus of our own, which are derived from the Sanskrit: *One*, he says, is "he;" *two*, "diversity;" *three*, "that which goes beyond;" *four*, "and three," that is, "one and three;" *five*, "coming after;" *six*, "and four," that is, "two and four;" *seven*, "following;" *eight*, "two fours;" *nine*, "that which comes after;" *ten*, "two and eight" Thus only *one* and *two* have distinct original meanings.

After reaching the *thousand* it will be noticed that a change occurs in the method of grouping. Previously, *ten* of the old groups make *one* of the next higher group; but after the third group, or *thousand*, it requires a *thousand* of an old group to make *one* of the next group which receives a new name. Thus a group of a *thousand* thousands is called a *million;* a *thousand* millions, a *billion*, etc. This change in the law of naming groups is not a thing of chance, but of science; as it is a matter of great convenience in naming the larger numbers.

Notation.—In writing numbers, we do not use common words, nor have a special character for each number. The method of notation is based upon the principle of using a *few characters* to express the first few numbers, and expressing the groups by the *position* of these characters. The foundation principle is that of *place value*, the groups being represented by the simple *device of place.*

This method seems to have originated among the Hindoos, and is now adopted by all civilized nations. It is usually called the Arabic system, from the fact that it was introduced into Europe through the Arabs; and was for a time supposed to have originated with them. The methods of notation used by the Greeks and the Romans were much inferior to that of the Hindoos, so much so that it was impossible to employ the Roman system, at least, in calculations.

The invention of the Arabic system of notation is one of the greatest achievements of the human mind. Without it, many of the arts would never have been dreamed of, and the science of astronomy would still be in its cradle. With it, man becomes armed with prophetic power, predicting eclipses and occultations, determining the existence of worlds which the eye of the telescope had never seen, and marking out with unerring accuracy the orbits of planets and their position in the heavens for centuries to come.

Origin of Characters.—The origin of the characters is not definitely known. Three theories have been given for them,—that of a combination of *straight lines*, that of a combination and modification of *angles*, and that of *initial letters*. It has been supposed that people began to represent numbers by straight lines, and that these might have been combined into our present Arabic digits. It has also been supposed that angles may have been used to indicate numbers, and that a combination of these might have been modified into the present forms. Prinseps, a profound Sanskrit scholar, thinks that they were originally the initial letters of the Sanskrit numerals. This theory is rendered plausible from the fact that the Romans, Greeks, and Hebrews used letters to represent numbers.

The origin of the *cipher*, by the first of these theories, is accounted for by supposing it to have been represented by a circle, suggested by counting around the fingers and thumb held in a circular position. By the second theory, if characters with angles represented numbers, a character with no angles, like a circle, would represent nothing. The third theory does not account for the zero, the most important character of them all. "It would be highly important," says Max Müller, "to find out at what time the naught first occurs in Indian inscriptions. That inscription would deserve to be preserved among the most valuable monuments of antiquity, for from it would date in reality the beginning of true mathematical science,—impossible without the naught,—nay, the beginning of all the exact sciences to which we owe the invention of telescopes, steam engines, and electric telegraphs."

The Numerical Base.—The basis of the method of expressing numbers is *decimal*. This arises from the fact that arithmetic had its origin in counting the fingers of the two hands. There are traces in several languages of other numbers besides *ten* being used as the basis of the system of counting; but all civilized nations have counted by *tens*. From this general use of the decimal scale, it has been inferred that it possesses some intrinsic excellence; yet the fact is, that it is liable to many objections, a few of which we will mention.

First, the decimal scale is unnatural. A grouping by tens is seldom seen in nature or art. Nature groups in *pairs*, in *threes*, in *fours*, in *fives*, and in *sixes;* but seldom or never by *tens*. Man doubles, and triples, and quadruples; he divides into halves, thirds, and fourths; but where does he estimate by *tens* or *tenths*, outside of arithmetic? There is nothing natural about the matter, except the fingers; and these are grouped by fours instead of fives.

Second, the decimal scale is unscientific. It originated by chance, by a mere accident. Had science, instead of chance, presided at its birth, we should have had a basis that would have given a new beauty and a greater simplicity to the admirable system of arithmetical language.

Third, the decimal scale is inconvenient. This arises from the base, *ten*, not being divisible into the simple fractional parts,—*third*, *fourth*, and *sixth*. These fractions, which are in common use, cannot be conveniently expressed in the decimal scale, the *fourth* requiring two places, and the *third* and *sixth* giving interminate decimals. Were the basis of the scale *twelve* instead of *ten*, all these fractions could be expressed in a single place.

A Duodecimal Base.—The Duodecimal Scale would be much more convenient than the decimal. This is especially apparent in the expression of fractions in the numerical scale. In the duodecimal scale, we could express $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, and $\frac{1}{6}$ in a single place, while $\frac{1}{8}$ and $\frac{1}{9}$ would require but two places. Thus, in the duodecimal scale, we should have $\frac{1}{2}=.6$, $\frac{1}{3}=.4$, $\frac{1}{4}=.3$, $\frac{1}{6}=.2$, $\frac{1}{8}=.16$, and $\frac{1}{9}=.14$. The fractions $\frac{1}{5}$ and $\frac{1}{7}$ both give perfect repetends in the duodecimal scale,—thus, $\frac{1}{5}=.\dot{2}49\dot{7}$ and $\frac{1}{7}=.\dot{1}86\Phi3\dot{5}$; but this would be no disadvantage, as these fractions are seldom used in actual life. The character Φ is used to express *ten*, for both *ten* and *eleven* would be represented by a single character in the duodecimal scale.

There seems to have been a natural tendency towards a duodecimal scale. Thus a large number of things are reckoned by the *dozen;* and the scale is even extended to the second and third degree,—to the *gross* and *great gross.* In our naming of numbers, the terms *eleven* and *twelve* seem to postpone the forming of a group until we reach a dozen. A similar fact is noticed in the extension of the multiplication table to "12 times." The division of the year into twelve months, the circle into twelve signs, the foot into twelve inches, the pound into twelve ounces, etc., are further indications of the same tendency.

A change of our numerical base has been advocated. Leibnitz preferred a binary base, and composed a binary arithmetic. Charles XII. of Sweden seriously contemplated introducing the duodecimal system into his dominions, and was probably prevented doing so only by his early death. If this change could be made, it would greatly simplify the science of numbers, and facilitate its applications. For a fuller discussion of this subject, see *Philosophy of Arithmetic.*

III. The Reasoning of Arithmetic.

The science of arithmetic, like geometry, embraces *ideas* and *truths.* These ideas give rise to *definitions;* and the truths are expressed in *axioms* and *theorems* or *principles.* The axioms are the self-evident truths that flow out of our numerical conceptions; the principles are derived by reasoning. These principles may be applied in deriving *methods of operation* and in the *solution* of practical problems. The statement of the method of operation gives us the *rules* of arithmetic.

Definitions.—The definitions of arithmetic are concise descriptions of the ideas of the science. These ideas are of three different classes. First, we have our ideas of numbers as *quantities;* as a *unit*, a *fraction*, a *multiple*, etc. Second, we have ideas of *operation;* as, *addition*, *subtraction*, etc. Third, we have ideas of *relation;* as, *ratio*, *proportion*, etc

The statement or description of these several classes of ideas, gives us the *definitions* of arithmetic. The definitions of arithmetic are consequently of three classes; definitions of Quantity, of Operation, and of Relation.

Axioms.—The axioms of arithmetic are the self-evident truths which belong to the subject. They are of two classes; those which pertain to quantity in general and those which pertain to number in particular. Among the former are the following: "The whole is greater than any of its parts;" "Things which are equal to the same thing are equal to one another;" etc. Among the latter class of axioms may be mentioned the following: "Similar numbers only can be added;" "The multiplier is always an abstract number;" etc.

The arithmetical axioms of the second class arise out of the particular conceptions of arithmetic. Each new conception of a relation or a process gives rise to one or more self-evident truths. Thus, as soon as we attain the idea of a *factor* as a *maker* of a number, we immediately perceive the truth that "a factor of a number is a divisor of the number." Also, as soon as we attain the idea of a *multiple* of a number as *a number of times* the number, we perceive the self-evident truth that "a multiple of a number contains the number."

Reasoning.—All reasoning is *comparison*. A comparison requires a standard, and this standard is the *fixed*, the *axiomatic*, the *known*. The law of reasoning is to compare the *complex* with the *simple*, the *theoretic* with the *axiomatic*, the *unknown* with the *known*. By this comparison we pass from the *simple* to the *complex*, from the *old* to the *new*, from the *known* to the *unknown*.

The reasoning of arithmetic is deductive. The basis of the reasoning is the ideas and self-evident truths, or the definitions and axioms. The definitions present the forms of quantity about which we reason; the axioms present the truths which guide us in the reasoning process. With these as a basis we trace our way by comparison from the simplest truth to the profoundest theorem.

Some writers hold that there is no reasoning in arithmetic, but that its operations and principles are the result of intuition or immediate judgment. This mistake arises from supposing that the science of arithmetic is contained in and grows out of addition and subtraction, which are regarded as purely mechanical processes. Comparison lies at the basis of arithmetic, unfolds the two primary processes, and gives rise to other processes not contained in addition and subtraction. The processes of reasoning in arithmetic can be reduced to the syllogistic form the same as in geometry. The demonstration of principles in arithmetic can be made as logical as those in the science of form. Besides, if there were no reasoning in arithmetic there could be no science of arithmetic.

Arithmetical Analysis.—One of the most common forms of reasoning in arithmetic is that known as *Arithmetical Analysis.* It is a process of reasoning by comparing numbers through their relation to the Unit. Assuming that all numbers are so many times the single thing, they bear a definite relation to the unit which is immediately apprehended. From this evident and simple relation to the unit, all numbers, integral and fractional, can be readily compared with one another, and their properties and relations determined. The process is readily illustrated by solving the problem, "If 3 times a number is 18, what is 5 times the number?" or, "If $\frac{3}{4}$ of a number is 30, what is $\frac{4}{5}$ of the number?"

This simple process of analysis runs through the whole science of arithmetic. It is its key-note; its basis principle. The Unit is the fundamental idea to which and from which we reason. It is a sort of arithmetical centre around which the reasoning process revolves, as the planets around their solar centres. The process is called *analysis;* but it will be noticed that it contains a *synthetic* element also. When we pass from a collection to the single thing, that is, from a *number* to the *unit*, the process is analytic; but when we pass from the *unit* to a *number*, the process is synthetic. Both processes are included under the more general term *Comparison.* Comparison is properly the thought process; Analysis and Synthesis are mechanical processes.

The Equation.—The Equation lies at the basis of mathematical reasoning. The Equation is a universal form of thought, and belongs to arithmetic as well as to algebra. The simplest process of arithmetic, "One and one are two" ($1+1=2$), is really an equation, as much so as $x^2+ax=b$. The equation is an indispensable element of arithmetical reasoning; it is the key with which we unlock the most complex problems of the science of numbers.

The equation in arithmetic assumes several different forms. Its primary form is that used in comparing two equal quantities of different form; as $2\times 3=6$, in which 2×3 is one form of quantity and 6 another, the two equal in value, but involving quite different conceptions. A comparison of unequal quantities gives us *ratio*, which may be expressed in the form of an equation; as $8:4=2$. A comparison of equal ratios gives us an equation of relations, called a *proportion;* as $8:4=12:6$, a proportion being in reality an equation. In arithmetical analysis, an unknown number involved with known numbers is equated with known numbers; as "3 *times a number equals* 24." The treatment of the equation in arithmetic gives rise to *transposition* and *substitution*, as may be seen in arithmetical analysis.

That the equation belongs to arithmetic is thus evident. Every formal comparison between two quantities necessarily leads to it; and such comparisons are continually made. All of our reasoning involves it; we cannot think in arithmetic without the equation. The mind here takes its first steps in equational thought which, when continued, leads to the high places of mathematical science. Here the young mind plumes its wings to follow the great masters in their lofty flights in the regions of abstract thought, far beyond that to which the science of arithmetic could ever attain.

Induction in Arithmetic.—Arithmetic is a deductive science, and most of its truths are derived by deduction. It is possible, however, to obtain some of its truths by induction. Upon seeing that a certain thing holds good in several cases, we may often correctly infer that it holds good in all cases and is a general principle. Thus the property of *divisibility by nine* may be presented to a learner inductively before he is able to understand a demonstration. The principles of fractions may also be derived inductively from the examination of special cases. Indeed, many arithmetical truths were first discovered in this way and afterward demonstrated. The law that "every number is a triangular number, or the sum of two or three triangular numbers; a quadrangular number, or the sum of two, three, or four quadrangular numbers;" etc., has never been demonstrated except for triangular and square numbers, though it is known from induction to be perfectly general.

The same method of reasoning is possible also in algebra. Newton's Binomial Theorem was derived by pure induction; the author left no demonstration of it, and yet it was regarded as one of his greatest discoveries and was engraved upon his tomb in Westminster Abbey. Legendre, in his *Theory of Numbers*, gives a formula for finding the number of primes up to a certain limit, which has never been fully demonstrated.

Care must be exercised in the use of induction in mathematics; some propositions derived by induction were subsequently found to be untrue. Fermat stated that the formula 2^m+1 is always a prime when m is taken any term in the series 1, 2, 4, 8, 16, etc.; but Euler found that $2^{32}+1$ is a composite number. Euler made a similar mistake in his formula for resolving the equation $x^2+Ay=B$, which was detected by Lagrange. Some of the formulas for primes illustrate the same point. Thus, x^2+x+41 gives primes for the first *forty* values of x; x^2+x+17, for the first *seventeen* values; and $2x^2+29$, for *twenty-nine* of its first values.

IV. The Treatment of Arithmetic.

The Science of Arithmetic is embraced in the three operations,—Synthesis, Analysis, and Comparison. Synthesis and Analysis give rise to two classes of operations, distinguished as Primary and Secondary, or Fundamental and Derivative.

I. Fundamental Operations.—The Fundamental Operations include Addition, Subtraction, Multiplication, and Division. They are called fundamental because they lie at the basis of all other arithmetical operations.

Definitions.—Addition is the process of finding the *sum* of two or more numbers. Subtraction is the process of finding the *difference* of two numbers. Multiplication is the process of finding the *product* of two numbers. Division is the process of finding the *quotient* of two numbers. By using the terms *product* and *quotient* in defining multiplication and division, we secure a happy uniformity in the four definitions that has not heretofore existed.

Cases.—Each of these operations embraces two general cases: first, to find the results independently of the notation used to express numbers; second, to find the results of numbers as expressed in written characters. The first case in each is a process of pure arithmetic, independent of any notation; the second case in each has its origin in the Arabic system of notation.

Treatment.—The two distinct cases require distinct methods of treatment. In the former case, we operate on the numbers directly *as wholes;* in the latter case, we operate upon them *by parts.* The first method is independent of any notation; the second method in each is developed by means of the *elementary results* obtained by the first method.

We obtain the *elementary sums* by intuition; we obtain the *elementary differences* by intuition, or by an inference from the elementary sums; we obtain the *elementary products* by addition; we obtain the *elementary quotients* by successive subtraction, or by a reversing of the *elementary products.* These elementary results are used in obtaining the results with large numbers expressed in the Arabic system. A brief discussion of the philosophy of the methods of operation with the Arabic system is recommended.

II. SECONDARY OPERATIONS.—The Secondary Operations are Composition and Factoring, Common Divisor and Common Multiple, Involution and Evolution. The new division, called Composition, seems necessary for scientific completeness, that each analytical operation may have its corresponding synthetical operation. It is also convenient in naming certain operations for which we formerly had no appropriate term.

Definitions.—*Composition* is the process of forming composite numbers out of the factors. *Factoring* is the process of finding the factors of composite numbers. A *common divisor* of two or more numbers is a number that will exactly divide each of them. A *common multiple* of two or more numbers is a number which is one or more times each of those numbers. It is usually defined as a number which contains these numbers, but this does not include the idea of multiple.

Treatment.—In treating these subjects, we first establish some general principles, and then derive the methods of operation from these principles. It will be well to require the student-teacher to show the method of development of each division, and to point out the philosophy of the method of treatment.

III. COMMON FRACTIONS.—Integers originate in a synthesis of units, fractions in a division of the unit. A fraction involves three things: first, a division of the unit; second, a comparison of the part with the unit; third, a collection and numbering of the parts. A Fraction is thus a triune product —a result of analysis, comparison, and synthesis. A fraction may also arise from the comparison of numbers.

Definition.—A Fraction is a number of equal parts of a unit. This seems to be an improvement on "one or more equal parts of a unit." Since the *parts* of a unit are numbered, these may be called *fractional units*, and a fraction may be defined as *a number of fractional units.* Among many of the incorrect definitions, we mention,—"A fraction is a part of a unit;" "A fraction is an expression for one or more of the equal parts of a unit;" "A fraction is nothing more nor less than an unexecuted division."

Cases.—The cases of fractions are all included under Synthesis, Analysis, and Comparison. To perform the synthetic and analytic processes, we need to change fractions from one form to another; hence Reduction enters largely into the treatment of fractions. The *comparison* of fractions gives us several cases called Relation of Fractions. The student-teacher may state the cases.

Treatment.—There are two methods of developing common fractions, known as the Inductive and Deductive Methods. By the Inductive Method, we solve each case by analysis, and derive the *rules* by inference or induction. By the Deductive Method we first establish a few general principles, and then derive rules of operation from these principles. The Inductive Method is simpler for young pupils; the Deductive is more satisfactory for older pupils. The student-teacher may illustrate both methods.

Principles.—The deductive method is based on certain *principles* which express the law of multiplying or dividing the terms of a fraction. These principles can be demonstrated either by the principles of division or independently as fractions. The latter method is by far the better. There should be a real demonstration, and not some loose statement such as we often find in arithmetics.

IV. Comparison.—We have not room to indicate the treatment of comparison, but refer the student to the author's *Philosophy of Arithmetic.* A review of the subjects of arithmetic, pointing out the philosophy of its methods of treatment, would be of advantage to the student-teacher.

V. The Course in Arithmetic.

Arithmetic, for the purpose of instruction, may be divided into two parts; *Mental Arithmetic* and *Written Arithmetic.* In Mental Arithmetic the problems are solved without the aid of written characters. In Written Arithmetic the operations are performed with the aid of written characters.

Oral Arithmetic.—Many educators divide the course into Oral and Written Arithmetic; and at first thought such a division seems plausible and natural. Language is of two kinds, oral and written; when we solve problems without written characters it is naturally called oral arithmetic; when the operations are performed with written characters it is naturally called written arithmetic. Such a division is, however, a mistake, and results from a superficial view of the subject. Written Arithmetic is just as oral when recited as Mental Arithmetic; and Mental Arithmetic is no more oral when not recited than Written Arithmetic. Both are oral when recited; neither is oral when not recited.

Intellectual Arithmetic.—Nearly all authors of Mental Arithmetic call their works Intellectual Arithmetic. The term Intellectual is, however, objectionable, as it does not accord with popular usage. No one thinks of calling a "mental solution" an "intellectual solution;" or would say, "he solved it intellectually," but rather, "he solved it mentally."

Practical Arithmetic.—Many authors call their works on written arithmetic, Practical Arithmetic. This, however, is a misnomer; all arithmetic should be practical, mental arithmetic as well as written arithmetic. The proper term is *written*, to indicate that we employ written characters. The term "Practical" may do very well as a "trade mark" but it should not pretend to any scientific accuracy. It was suggested by Orontius Fineus, in 1535, in a work entitled *Arithmetica Practica;* and first used by Joseph Chapman in 1732 in a work entitled "Practical Arithmetic Compleat."

True Division.—The natural division of the subject is, therefore, into Mental Arithmetic and Written Arithmetic. There are several considerations in favor of the term Mental. First, it is in accordance with the popular usage, for all persons would say of a solution without the aid of written characters, "he solved it mentally," and not "orally" or "intellectually." Second, the distinction is philosophical. Both methods of solution employ the mind, and one employs the written characters also, and it is appropriate to distinguish the two methods by this distinguishing characteristic, calling that which employs written characters Written Arithmetic, and the other, which is purely mental, Mental Arithmetic. One is *purely mental* and the other *mental and written*, and it is natural and convenient to distinguish them by names which indicate these distinguishing characteristics.

School Course.—The common school course of arithmetic may be divided into two parts; Primary Arithmetic and Advanced Arithmetic. The Primary Arithmetic is designed to teach a child the elementary ideas and processes of arithmetic; the Advanced Arithmetic is designed to present as full a knowledge of the science as should be taught in our public schools. In some schools a course in *Higher Arithmetic* may also be required, including the more abstruse principles of the science and a more extended application of them.

Number of Books.—If mental and written exercises are combined after the Primary Arithmetic, the entire course may be embraced in two books, which may be called the *Primary Arithmetic* and the *Union Arithmetic.* If it is thought best to separate the mental and written exercises after the first book, we shall have three books in the course, which may be distinguished as the *Primary Arithmetic*, *Mental Arithmetic*, and *Written Arithmetic.* In schools of a certain grade there has been a demand for a book between Primary and Advanced Arithmetic, which has been met by an *Elementary Arithmetic.*

Union Arithmetic.—Mental and written exercises should be combined in the Primary Arithmetic, and many teachers advocate this union throughout the entire course. The reasons are: 1. Economy of time; 2. Economy in the purchase of books; 3. One aids in learning the other; 4. The sole object of Mental is to aid in the study of Written. The objections are; 1. Their object is different; the object of Mental is *discipline in analysis*, the object of Written is *skill in calculation;* 2. Their spirit is diverse; one being *analytic* and the other more *synthetic;* 3. They cannot be properly coördinated; 4. Hence to combine is to neglect Mental. The present desire for combination is an example of history repeating itself, as may be seen in the works of Smith, Emerson, etc. Whether this demand will be permanent, or, like a new fashion, change again in a few years, time will decide.

Extent of Course.—Many teachers think the present common school course in arithmetic too extensive, but we doubt it. The child needs a thorough drill in arithmetic for the thought-power it imparts; and for the practical value of arithmetical knowledge. Every child coming out of our public schools should have a good practical knowledge of nearly every subject treated in the ordinary common school arithmetic to prepare him for the practical duties of the business world.

Course in Arithmetic.—We shall discuss the subject under three heads; *Primary Arithmetic*, *Mental Arithmetic*, and *Written Arithmetic*. These three parts are not entirely distinct; to some extent they run into and overlap one another; but a clearer idea of the principles and methods of instruction can be given by such a division. The several subjects embraced in the course are as follows:—1. Ideas of Numbers; 2. Arithmetical Language; 3. Operations of Arithmetic; 4. Reasoning of Arithmetic; 5. Definitions of Arithmetic; 6. Rules of Arithmetic; 7. Principles of Arithmetic; 8. Applications of Arithmetic. In the next three chapters we shall consider the methods of teaching Arithmetic.

CHAPTER III.

TEACHING PRIMARY ARITHMETIC.

THE course in Primary Arithmetic should embrace the Ideas of Numbers, Arithmetical Language, the Fundamental Operations of Synthesis and Analysis, the Elements of Fractions, and the Elements of Denominate Numbers. In other words, the course should embrace the elements of Numeration and Notation, the elements of Addition, Subtractraction, Multiplication, and Division, the elements of Fractions, and the elements of Denominate Numbers.

Principles of Teaching.—In presenting these subjects to the learner, it is believed that the course of instruction should be based upon the following principles:

1. *The first lessons in arithmetic should be given by means of oral exercises.* Such instruction is needed for several reasons: First, pupils can learn arithmetic before they can read; and hence, of course, before they can use a book. Second, even with pupils who can read, such exercises are a very valuable preparation to the study of the subject in the text-book. Third, more thought can be developed, more interest awakened, and much more rapid and thorough progress can be made with such exercises. These exercises should be continued throughout the entire course in arithmetic. Every subject, even in the more advanced parts of written arithmetic, should be introduced by such exercises.

2. *The first lessons in Primary Arithmetic should be given by means of sensible objects.* Such exercises will give distinct ideas of arithmetical quantities. Children's numerical ideas are often vague and indefinite. The names of numbers are often merely abstract terms to them. The denominations *ounces*, *gills*, *pints*, *cords*, etc., are often mere words without

any concrete meaning to them. The ideas and processes of fractions cannot be clearly understood by children without such illustrations.

The objects used may be marbles, grains of corn, beans, peas, little blocks, etc. Dr. Hill says the whole science of arithmetic may be taught with a pint of beans. The most convenient object for many of the processes is the Numeral Frame, or *Abacus*. This should be in every public school, and should be in constant use. Large ones, three or four feet square, are used in the primary schools of Sweden, Germany, etc. Many authors give pictures of objects, marks, stars, etc., in their books; but these do not seem to be necessary, as the objects themselves are better than the pictures of objects. Besides, no pupil should begin to study arithmetic in a text-book, who needs pictures to aid in the primary operations.

3. *In Primary Arithmetic, the order of instruction is,—first the method, then the reason for it; first the mechanical part, then the rational.* This is the natural order of development with children; *first the how and then the why.* Methods of doing should be taught before the reasons for doing; ideas should be taught before the expression of them; operations before rules describing operations. Principles should follow problems; not precede them. Much precious time has been wasted in primary instruction by the violation of this principle; and minds have been dwarfed by being led to incorrect habits of study and thought.

4. *In Primary Arithmetic, the method of teaching should be inductive.* The pupil should be led to each new idea and process by appropriate questions and illustrations. The definition should be drawn from the ideas, rather than the ideas from the definition. The pupil should be led to see the principle clearly before he is required to state it; and rules or methods should be derived by inductive inferences from analytic solutions. The child should be led to see the propri-

ety of a new term for the expression of a new idea, when possible, for he will then see the meaning of it.

5. *Mental and Written Arithmetic should be united in Primary Arithmetic.* This is indicated by the logical relation of the subjects. As soon as the pupil can express arithmetical ideas orally, he is ready to learn to express them in written language. This combination is also a matter of practical convenience. A pupil will learn more rapidly by having the two taught together. Each will throw light upon the other, and assist the pupil in understanding and remembering it. Mental and written exercises are mutually dependent in the primary processes; the mental exercise prepares for the written, and the written aids the mental. They should, therefore, go hand in hand in primary instruction.

Whether these exercises should be mixed along through the book, or whether they should be given separately, requiring the teacher to mix them in his instruction, is a question. As an abstract question, we believe it would be best to give them separately and have the teacher combine them in his instruction. With young and inexperienced teachers, however, it will probably be best for the text-book to unite the two kinds of exercises as the author thinks they should be naturally developed together.

I. Teaching Arithmetical Ideas and Language.

Arithmetical Ideas.—The first step in the science of numbers is the attainment of numerical ideas. The ideas of numbers originate in a succession of mental states constituting periods of time. With children the idea begins with the perception of objects, and is developed by a process called *counting*. The earliest ideas are usually learned upon the mother's knee, as she fondles with the little fingers, or numbers the toys with which childhood beguiles the happy hours. Still, though a child may be able to count when entering school, an exercise for a fuller development of the numerical idea should not be omitted.

In counting, we should not rest satisfied with the mere naming of numbers in succession, for a child may do this and have no idea of the meaning of the words used. *One*, *two*, *three*, etc., may be to it a mere succession of sounds, like *do*, *re*, *mi*, etc., without embodying any idea of collections. Children have been known to run off these words very glibly, even as far as a hundred, without being able to select a dozen grains of corn from a collection.

Children should be required to count with objects. The numeral frame is the most convenient, though other objects may be used. A counting exercise may be made lively by increasing and diminishing the number by several at the same time. Little *counting games* with beans or grains of corn, will also be found interesting. Counting exercises should be continued until the pupils can count readily, and have definite ideas of numbers. If pupils can count when they enter school, these exercises need not be continued long. Pupils should be taught to count *backwards* as well as *forwards*. This will be of advantage in learning to subtract, as we may "count off" to find a difference, as well as "count on" for a sum.

ARITHMETICAL LANGUAGE.—Arithmetical Language is the method by which we express numbers. It is both oral and written; the former is called *Numeration*, the latter is called *Notation*. In teaching arithmetical language, Numeration should precede Notation. This appears from the fact that oral language comes before written language. This is a point which seems to have been overlooked by some writers, for they speak of "Notation and Numeration," as if the latter followed the former in the natural order. The reason for this mistake is that they restrict Numeration to the reading of numbers after they are expressed in figures.

Numeration.—The oral language of arithmetic must be taught in connection with the development of the idea of number. The idea and the word are so intimately related that the former leads immediately to the latter; they are twinborn, and go hand in hand in pure arithmetic. The names of numbers are, therefore, taught with objects and by means of *counting.*

Two Methods.—There are two methods of teaching the names of numbers, which may be distinguished as the *Common Method* and the *Scientific Method.* These two methods agree as far as *ten.* By the Common Method, we teach children to say *eleven*, *twelve*, *thirteen*, etc., using the names after *ten* just as arbitrarily as we do the names of the first simple numbers up to *ten.* The method does not indicate to the pupil the method by which numbers are named,—that is, the principle of grouping by tens.

By the Scientific Method, when we reach *ten*, we give the pupils the idea of a group, and then, instead of having them say *eleven*, *twelve*, etc., we require them to say *one and ten*, *two and ten*, *three and ten*, etc., up to *ten and ten*, which we show them consists of *two groups* of ten, and teach them to count *two tens*, *two tens and one*, etc., etc. After the pupils are familiar with these forms, we show them that these expressions have been changed into those in common use; thus, *three and ten* may be abbreviated by dropping the "and," changing *three* to *thir*, and *ten* to *teen*, giving *thirteen;* and similarly for the other names.

The advantage of this method of teaching the names of numbers is, that it leads pupils to see the *principle* by which numbers are named which, by the ordinary method, is so concealed that it generally never occurs to their minds. It is also an excellent preparation for Notation, and greatly simplifies the task of teaching pupils to express numbers by figures. Some excellent teachers of primary arithmetic teach pupils to count by using *one-teen*, *two-teen*, *three-teen*, etc., also *two-ty one*, *two-ty two*, etc., that they may see the law by which numbers are named.

The groups may be indicated by the numeral frame, or by a little bundle of sticks, or by marks on the board enclosed by a circle. The grouping of *ten tens* for the *hundred*, and *ten hundreds* for the *thousand*, may also be explained and illustrated. The law of naming numbers beyond the thousand is best illustrated in connection with the writing of numbers.

Notation.—When the pupils have acquired a little familiarity with the oral language of arithmetic, they are to be taught its written language. As soon as they have learned a few names of numbers, they should learn to express them in written characters. A knowledge of the written language of arithmetic includes a knowledge of the *characters* and the method of *combining* them. We first teach the arithmetical *characters* to express the first few numbers, and then their *combination* to express the numbers above *nine*.

The Characters.—We first give the *nine digits*, and drill the children in naming and writing them until they are entirely familiar with these characters. If they have learned a little addition and subtraction, they may use the characters in solving simple problems, the teacher giving no problem at present which involves a number greater than *nine*. Before the teacher explains the method of expressing numbers beyond nine, it would be well to have the pupils try how they would express twelve, thirteen, etc., with the characters which they have learned. Their very failure will prepare them tc appreciate the correct method when presented by the teacher.

Combination of Characters.—There are two methods of teaching the combinations of the characters, or of teaching the written language from *one* to *one hundred*, which may be distinguished as the *Common Method* and the *Scientific Method*. By the Common Method, we give the combined characters without explaining the principle of the combination. Thus we teach that 10 expresses *ten*, 11 expresses *eleven*, 12, *twelve*, etc., without any reference to *tens* and *units*. This is the method which is usually employed, and seems to be preferred to the scientific method.

By this method, we would give the expressions for numbers as far as 20, and then drill the pupils in reading and writing them until they were entirely familiar with them. We would next give the expressions from 20 to 30, and drill in like manner and thus continue as far as 100. After pupils are familiar with this method of writing numbers as far as 100, the teacher may show the pupils the principle of the combination, that the figure in the first place represents *ones* or *units*, in the second place *tens*, etc. When this is understood, we should require the class to analyze these expressions as follows: Analyze 25 (twenty-five). In 25, the 5 represents 5 *units*, and the 2 represents 2 *tens*.

By the Scientific Method we explain the principle of the combination at the beginning. Having taught the pupils to count *one and ten*, *two and ten*, etc., we tell them that 1 placed at the left of another figure expresses a *ten*, and thus that 14 expresses 4 units and 1 ten, or "*four and ten;*" that 13 expresses 3 and 1 ten, or "*three and ten*," etc. Finally, they may be led to see that since 1 ten is expressed by a 1 in the second place, we need a character to express *no ones* in the *first place*. We then tell them that we use the *zero*, 0, for this purpose, and thus represent *ten* by 10, which is 1 *ten* and 0 *ones*.

The latter of these two methods is preferable. It is more philosophical, for it shows the principle of the Arabic method from the beginning, which the common method conceals. It is more practical, for pupils will learn to write numbers much more readily by it than by the other method. Give the pupils a few examples to illustrate the principle, and they will be able to express the rest of the numbers up to 99 without being shown by the teacher. Moreover, perceiving the principle of *place value* in the small numbers, they will have no difficulty in understanding it when applied to *hundreds*, *thousands*, etc.

Higher Groups.—After pupils are familiar with the naming and writing of numbers up to *ninety-nine*, they should be taught that the next group consists of *ten tens*, and is called a *hundred*, and that the *hundreds* are expressed by a figure in the *third place*. They should then be drilled until they can read and write in *units*, *tens*, and *hundreds*. They should then be taught that a group of *ten hundreds* is called a *thousand*, that *thousands* are expressed by a figure in the *fourth place*.

They should then be shown that the law of giving a new name for each higher group of tens is changed to giving a new name for each *third group;* and that the intermediate names and places are *tens* and *hundreds* of the old group. Up to this time the numeration has preceded and led the notation in the order of teaching ; after this it will be more convenient to invert the order, and let the notation lead the numeration. Numeration will thus be regarded not only as a method of naming numbers, but of reading them when they are written in Arabic characters.

Numerical Periods.—The pupils may then be taught to separate written numbers into *numerical periods*, and to name and remember the periods. Perpendicular lines may be drawn, and the columns headed *units*, *tens*, etc., and the pupil be drilled in writing numbers by putting the terms in the proper column. Such an exercise is not of much value if the teacher knows how to teach by the method previously suggested. The pupils should be drilled in reading and writing numbers until they are entirely familiar with the subject. Do not hurry over the subject; haste here is "bad speed." A thorough knowledge of Numeration and Notation will remove the usual difficulties of the fundamental rules.

H.	T.	U
3	5	7
6	3	8
5	0	6

This instruction in reading and writing the larger numbers should be presented gradually, in connection with the exercises in the fundamental rules. Do not keep the pupil at it until he has mastered it, but go on with adding and subtracting, etc., returning to the notation and numeration every day, thus keeping up a constant review, and adding a little to what has been previously given, as the pupils are ready for it. The student-teacher will now give a model lesson in teaching arithmetical language.

II. Teaching Addition and Subtraction.

While pupils are obtaining the *ideas* and *names* of numbers, and learning to *read* and *write* them, they should begin to *unite* and *separate* them; that is, they shonld begin the processes of Addition and Subtraction.

Principles of Teaching.—Instruction in these processes should be given in accordance with the following principles:

1. *Addition and Subtraction should be taught simultaneously.* This is indicated by the logical relation of the subject. Subtraction is the converse of addition, and the elementary differences should be derived from the elementary sums. Thus, as soon as the child sees that 3 and 2 are 5, he is ready to see that 5 less 2 is 3, or 5 less 3 is 2. Thus, also, in finding the difference of 9 and 5, instead of counting 5 off from 9 to see what remains, he should infer the difference by knowing that 4 and 5 are 9. The synthesis of numbers in obtaining the sum should, therefore, be accompanied by the analysis of numbers in finding the difference.

This method will be found to be especially convenient in practice. Taught in this way, the pupil will learn the elementary differences while he is learning the elementary sums. He will thus not need to commit a Subtraction Table, which seems almost a necessity if subtraction is taught separately from addition. Knowing the elementary sums, if he has been taught to derive the differences from the sums, he can immediately obtain a difference without resorting to a table.

2. *Addition and Subtraction should be taught by means of sensible objects.* This is indicated by the nature of the subject and the mind It is the way in which the pupils really

must attain the sums of numbers, if they are to understand them. So strong is this necessity that, if the teacher does not require pupils to use objects, they will themselves use them by counting their fingers or using marks on the slate or blackboard. What the pupils do by nature, the teacher should require to be done upon principle. They should be required to see the sums before they say them. The most convenient object for this purpose is the numeral frame.

The teacher should be careful, however, not to allow the pupils to use objects too long in adding and subtracting. They should be led from the concrete to the abstract, from seeing sums and differences, to thinking them. The habit, in pupils of nine or ten years of age, of counting the fingers or using strokes, shows poor teaching; and the practice should not be allowed.

3. *Pupils should be required to commit an addition table.* The neglect of this is very common, and the result is that very few pupils are ready in adding. It is not an unusual thing to see pupils who are entirely familiar with the multiplication table, using strokes or counting their fingers in solving simple problems in addition and subtraction. There is the same reason for committing an addition table as there is for committing a multiplication table. Pupils should be required to *make* and *study* an addition table. They should write it on the board, that seeing it may aid to fix it in the memory.

Course of Lessons.—The course of lessons in Mental Addition and Subtraction is as follows:

1. Teach the pupil to *increase* and *diminish* by *ones* as far as 12 and 1, or 13.

2. Teach the pupil to *increase* and *diminish* by *twos* as far as 12 and 2, or 14.

3. Teach the pupils to *increase* and *diminish* by *threes* as far as 12 and 3, or 15.

4. Teach the pupils to *increase* and *diminish* by *fours*, by *fives*, by *sixes*, etc., up to 12 and 12, or 24.

5. Have the pupils write these *sums* and *differences* in a table and study and recite them.

6. Teach them to increase a number greater than 12 by 1, 2, 3, etc. Thus, since 14 and 5 are 19, 24 and 5 are 29, etc. Also to diminish in a similar manner.

Model Lesson.—Teacher, taking one book in his hand, asks, How many books have I in my hand? *Pupils*. One book. *Teacher*, taking another book in his hand, asks, How many books have I now? *P*. Two books. *T*. How many then are one book and one book? *P*. Two books. *T*. How many then are one and one? *P*. One and one are two. *T*. How many books have I in my hand? *P*. Two books. ***T***. I will take one book away; how many books have I now? *P*. One book. *T*. One book taken from two books leaves how many books? *P*. One book. *T*. One from two leaves how many? *P*. One from two leaves one. Continue this exercise, and apply it also to *two, three*, etc.

Practical Exercises.—The following exercises will be found valuable in teaching pupils to add and subtract with readiness and accuracy. Frequent drill upon such exercises is recommended.

First Exercise.—The teacher will name two numbers and require the pupils to give first their sum, and then their difference; thus, the teacher says, "5 and 2?" *Pupils*. "5 and 2 are 7, and 2 from 5 leaves 3." After a little practice they may omit *naming the numbers*, and merely say, "The sum is 7, the difference is 3;" or "7, 3." To vary this, the boys may give the sum, and the girls the difference, and *vice versa;* or, if the class is all of one sex, a division may be made, one part giving the *sum*, and the other the *difference*. In this and the following exercises, care should be taken that small numbers be used at first, until the pupils attain the ability to use larger numbers with ease and readiness.

Second Exercise.—The teacher will select some number, and then give one part of this number and require the pupils to give the other part. Suppose 8 to be the number; the teacher says "*five*," pupils answer, "*three;*" teacher, "*two*," pupils, "*six*," etc., etc.

Third Exercise.—The pupils should also be required to add by *twos, threes*, etc., merely *naming the results*, as follows: 2, 4, 6, 8, etc., 3, 6, 9, etc., until the additions can be readily given. Begin also with *one*, and count by *twos*, thus: 1, 3, 5, 7, etc.; also at 1, and count by *threes*, thus: 1, 4, 7, 10, etc.; also at 2, thus: 2, 5, 8, 11, etc.; continuing the addition as far as it may be thought desirable.

Let the pupil in a similar manner add by *fours, fives*, etc., up to *twelves*.

Such exercises should be continued day after day, in connection with the lessons which precede and follow this lesson, until great facility is acquired in the operations.

Fourth Exercise.—Give a pupil a number and require him to separate it into *two parts;* then into *three parts*, etc. Thus 6=3+3; 6=4+2; 6=5+1. Also 6=2+2+2; 6=4+1+1; 6=3+1+2; etc.

Fifth Exercise.—Let the teacher write two columns of figures on the board, as indicated in the margin. Call the first column *additive*, and the second *subtractive*. The teacher then with the pointer will indicate the number, the operation being indicated by the column. When he points to a figure in the first column, the number which it indicates will be added, but when he points to a figure in the second, the number indicated will be subtracted from the result which the pupils have previously obtained. If the Arabic characters have not been given, numerical *words* may be written in columns, instead of the *figures*.

+	—
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9

These exercises may be conducted sometimes in *concert* and sometimes *singly*. While one is adding alone, let the others keep careful watch for errors; a good degree of interest may thus be created, each pupil trying to obtain the largest sum before making a mistake.

Written Addition.—While the pupils are learning to add and subtract mentally, they should also perform work on the slate and blackboard with written characters. These exercises should first extend as far as the *elementary sums*, that is, to about "12 and 12 are 24." So far written addition and subtraction should go together with the mental exercises; but subsequently it is more convenient to separate them, teaching first addition and then subtraction.

Cases.—Written Addition should be presented in two cases; first, where there is nothing "to carry;" and second, where there is something to carry. In both cases, we should first require the pupils to learn to perform the operation without giving any reason for it. The primary object is to make them familiar with the mechanical operations. Subsequently they may learn to explain the work

Course of Lessons.—The course of lessons in Written Addition is as follows:

1. To write the elementary sums of the addition table.
2. To add single columns of numbers, in which the sum exceeds nine.
3. To add numbers of two, three, four, etc., terms, in which there is nothing to carry.
4. To add two columns in which there is something to carry, then three columns, etc.

Explanation.—The explanation may be given in what is called the Simple Form or in what is called the Full Form. By the Simple Form, the pupil will merely state the method without giving the reason for it. By the Full or Complete Form, the pupil gives the logical solution, which states each step in the process and the reason thereof. Young pupils should use the simple form, as they are not prepared to understand and state the reasons for the various operations. Much time has been wasted, and many youthful minds injured, by the attempt to have children give logical forms of explanation before they were prepared for them. With more advanced pupils, we should require full explanations, in concise, simple, and logical language, showing the reason for every step of the process. For the two forms, see the author's *Primary* and *Elementary Arithmetics.* The student-teacher will illustrate the subject in model lessons.

WRITTEN SUBTRACTION.—After the pupil is somewhat familiar with Written Addition, he should begin Written Subtraction. The subject should be presented under two cases: 1st, To subtract without "borrowing;" 2d, To subtract by "borrowing." The first of these cases should be taught before the pupils take the second case of addition; the second should follow the second case of addition. The pupil should be first taught the mechanical method of doing the work, without being shown the reason for it or being required to give any explanation of the process. A general idea of "borrowing" 10 from the next term of the minuend, and "carrying" 1 to the next term of the subtrahend, may be given to pupils who seem prepared to understand it; but no logical solution should be required at first.

Course of Lessons.—The course of lessons in Written Subtraction is as follows:

1. To write the elementary differences of the subtraction table.

2. To subtract numbers of two, three, etc. terms, when there is nothing "to borrow."

3. To subtract numbers of two terms, then of three terms, etc., when there is something "to borrow."

4. To subtract when there are two or more ciphers in the minuend.

Illustration.—The method of subtraction may be illustrated by bunches of little sticks, representing *tens*, *hundreds*, etc., and showing how one bunch of a higher denomination represents ten of a lower, and how we can "borrow" one of the higher and unite it with the lower denomination. Little heaps of pebbles, or of beans, or of grains of corn, and boxes, real or imaginary, may also be used, or pictures of them on the board representing the same. These may be of some aid to the beginner; but if the notation has been thoroughly taught, there will be very little need of concrete illustration. Let the student-teacher give a lesson on the subject.

Explanation.—Young pupils should first be taught to do the work, and afterwards be required to explain it. The explanation should at first be in a simple form, merely indicating the steps of the mechanical process. Older pupils should give a full logical explanation. There are two methods of explaining the second case, known as the "method of borrowing" and the "method of adding ten," either of which may be employed according to the preference of the teacher. It is difficult to decide which is the simpler, though teachers generally prefer the method of "borrowing;" and when there are no ciphers in the minuend, it is probably the simpler. When there are several ciphers in the minuend, the method of "adding ten" is simpler. The latter method is much preferred in *practice*. We should teach a pupil to subtract, in practice, by adding ten to the upper term, and adding one to the next higher term of the subtrahend, though many pupils are practising the opposite method at the present day.

III. Teaching Multiplication and Division.

As soon as the pupils can add and subtract a few of the smaller numbers, they should begin multiplication and division. The old way of teaching multiplication was to begin by putting a "table-book" in the hands of the pupils, and requiring them to commit the multiplication table. What the table meant, where it came from, what it was for, or where it was going to or going to lead them, they knew no more than they did of the origin or nature of a sunbeam.

Principles of Teaching.—There is a better, easier, and more natural way; and this way we will suggest in the following general principles:

1. *Multiplication should be taught as concise addition.* Thus the pupil should be taught that two 2's are 4, because $2+2=4$; or that two 3's are 6, because $3+3=6$, etc. Instead of the pupil's entering upon multiplication as a new and independent process, he will thus see the nature of the subject and its logical evolution from a general synthesis. He will see the origin and meaning of the *multiplication table;* and not regard it as a mere collection of abstract names and numbers to be committed to memory. He will be able to *make the multiplication table* for himself, and will see the reason for committing it to memory, that he may not have to derive the products every time he wishes to use them.

2. *Division should be taught as reverse multiplication.* Division can be taught in two ways; as *concise subtraction*, or as *reverse multiplication.* That is, the elementary quotients may be obtained by a process of subtraction, or by reversing an elementary product. Thus, if we wish to show a pupil how many times 4 is contained in 12, we can subtract 4 successively from 12 *three times* to exhaust 12; and thus infer that 4 is contained in 12 *three times.* We can also derive the quotient from the consideration that, since three 4's are 12, 12 contains three 4's, or 12 contains 4 *three times.*

Both of these methods are legitimate, but the method of reverse multiplication is preferred for two reasons. First, it is the more convenient in practice, since the *elementary quotients* can be immediately derived from the *elementary products*. By the method of concise subtraction, we should have to derive each elementary quotient by performing several subtractions, which would often be very tedious. Second, it avoids the necessity of committing a division table. If we derive the elementary quotients by subtraction, it would be necessary to arrange them in a table and commit them, as we do the elementary products; but if we obtain the quotients by reverse multiplication, we can derive them from the multiplication table, and will not need any table of division.

3. *Multiplication and Division should be taught simultaneously.* This is suggested by the logical relation of the two subjects. The two ideas are so intimately related that one grows directly out of the other. Every synthesis suggests naturally its opposite, an analysis. A multiplicative synthesis can hardly be made without the intimation of its opposite, a divisionative analysis. Thus, as soon as the pupil learns that *four times five are twenty*, he is prepared to see that *twenty contains five, four times.* The method suggested is thus founded upon and indicated by the laws of thought.

It is also much more convenient to present the subject in this manner. The same fact, a product, answers a double purpose; the additive process which determines a product, gives also the materials for a quotient. In practice we should have the pupil commit the whole of "one column" of multiplication before we have them derive the quotients. This principle applies to mental multiplication and division, and to the simple written exercises which represent these operations. In written multiplication and division proper, it is more convenient to teach the processes separately. Multiplication should be taught first, and after the pupils are quite familiar with the process, they should pass to division

Multiplication Table.—The Multiplication Table is a table of the elementary products. These products have to be committed to memory. This is not an easy task; indeed, it is one of the most difficult tasks with which the young pupil meets. It requires months and sometimes years for the child to become thoroughly familiar with it. In the early history of arithmetic in Europe, operations were often performed in such a way as to require only a portion of the multiplication table, on account of the extreme difficulty of committing the products to memory.

How shall we teach a child the table? The method of former times is not easily forgotten. The book was put into the child's hand, and sometimes the birch upon his back, that the products might be put into his head. Who does not remember the toil and the trouble; how we dreaded the result of a treacherous memory; how we rejoiced in "five times" and "ten times;" how we "stuck" on "9 times 7," and "7 times 8." and confounded "11 times 11," and "11 times 12;" and how, at last, through great tribulation, we scaled the mount and stood victor of a hard-fought battle at the top? Is there a better way than the old way?

The Method.—First, pupils should make the multiplication table for themselves. They will then see the nature and use of such a table, and will study it with more interest and commit it with greater ease. Second, when thus formed, study, recitation, frequent repetition, are necessary to fix it in the memory. The pupil must repeat it over and over, and be drilled upon it until he knows it. Third, writing it frequently on the slate or blackboard, will assist the pupil in committing it to memory. The seeing of it will tend to fix it upon the visual memory, which is often better than attempting to fix it in the oral memory. The eye will aid the ear in making the acquisition. Fourth, reciting the table in concert will also aid in learning it. It gives animation and zest to the recitation, and deepens the impression through the increase of interest.

The duller pupils will thus learn also from the brighter pupils The frequent hearing of the names associated together will at last make a permanent connection between the factors and the products, so that as soon as we think of one, the other will occur to us. Fifth, the singing of the table to a little tune is also recommended. This has been practiced by many teachers, and with good results. It is a pleasant exercise, and the pupil is learning a lesson while amusing himself with a song. There are several little tunes to which the words may be fitted; among the best is one known as "Sparkling Water," or "Old Dan Tucker," a coarse name for a beautiful melody.

Division Table.—Should a division table be committed to memory? It has been the custom of many teachers to have their pupils study and commit a table of quotients after they have committed a multiplication table. This, however, is not necessary, if division is taught as reverse multiplication. The multiplication table gives also the quotients, the product being regarded as the dividend, and the two factors as divisor and quotient. If, however, division be taught as concise subtraction, it will be necessary for a pupil to commit a division table, as he has no method of determining a quotient but by subtracting, or remembering it from a table.

Course of Lessons.—The course of lessons in Primary Multiplication and Division is as follows:

1. Lead the pupil to a clear idea of "times," and then of a number taken several times.

2. Lead the pupil to make the table of "*two times*," and have him commit it.

3. Apply the table of "two times," in solving little problems like "If one orange costs 3 cents, what will 2 oranges cost?"

4. Lead the pupil to derive quotients from "two times," and to apply these quotients to solving little problems.

5. Proceed in the same way with "three times," "four times," etc., up to "twelve times," deriving the quotients from each multiplication column.

6. Drill the pupils on writing and reciting the multiplication table until they have committed it.

Model Lesson.—How many *times* do you recite in a day? How many *times* does the clock strike at noon? If you have 2 cents in one hand and 2 cents in the other hand, how many times 2 cents have you? How many cents have you? How many cents then are *two times* 2 cents? If I move 3 balls over on this wire of the numeral frame, and then move three balls more, how many times 3 balls have I? How many balls in all? How many then are *two times* 3 balls? Write 4 on the board and then write 4 under it. How many times have you written 4? How many are 4 and 4? How many then are *two times* 4? Proceed in a similar manner up to 2 times 12. Then have them write the multiplication table on the board, using the signs $\times$ and $=$ as in the margin. When the pupils know the *products* of "2 times," reverse the process for the *quotients*, thus: How many 2's make 4? 4 then is how many 2's? 4 then *contains* how many 2's? 4 then *contains* 2 *how many times?* 2 then is contained in 4 *how many times?* Proceed in a similar manner with the other quotients drawn from "two times." Then have the division table written on the board, using the symbols $\div$ and $=$.

$2\times1=2$
$2\times2=4$
$2\times3=6$
$2\times4=8$
etc. etc.

After the pupils are familiar with the process of deriving the multiplication table by addition, lead them to see that they can obtain the successive products by increasing the last product by the number multiplied to find the next product. Thus, when they have "6 times 4 are 24," they can obtain 7 times 4 by adding 4 to the 24, making 28, etc. Many pupils will see this for themselves; those who do not should be led to see it by the teacher.

Practical Exercise.—To make pupils rapid and accurate in the mechanical processes of adding, subtracting, multiplying, and dividing, the following exercise is practiced by some teachers, with excellent results:

Let the teacher write four columns of figures on the blackboard, as is represented in the margin, the first column being additive, the next subtractive, etc., as is indicated by the symbols placed above them. The teacher, with the pointer, will point out certain figures, the corresponding numbers being added, subtracted, multiplied, or divided, as is indicated by the symbol at the head of the column. Care, of course, must be taken not to require a division by a number that is not exactly contained. This exercise may be continued for many recitations, in connection with the other lessons, with great advantage to the pupils.

(+)	(−)	(×)	(÷)
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9

Written Multiplication.—The pupils should write the elementary products and quotients as they are learning them. When they are familiar with the table, they are ready to learn written multiplication and division, properly so called. These should be taught separately, like written addition and subtraction. We should begin with multiplication and drill the pupils upon it until they are quite familiar with the process of multiplying.

Course of Lessons.—The subject should be presented in two cases; first, *when the multiplier does not exceed twelve*, and second, *when it does exceed twelve.* These two cases will include the following classes of problems:

1. Write the elementary products in the usual form of written multiplication.

2. Multiply when the multiplicand consists of several terms, but not requiring any "carrying;" as, 214 multiplied by 2.

3. Multiply when the multiplicand consists of several terms, the multiplier being one term, and the products require "carrying," as, 368 by 2.

4. Multiply when there are two or more terms in the multiplier; as, 457 by 23.

5. Multiply when there are one or more zeros in the multiplier.

6. Multiply when there are one or more zeros at the right of either or both multiplier and multiplicand.

Explanation.—The pupils should first be required to do the work without giving any explanation of the process. When they have become familiar with the operation, they may be required to state the different steps of the process without giving the reason for the same. This is what is called the *simple form* of solution. Advanced pupils should be required to give a full logical solution, in which the reason for each step is logically stated. For the simple form, see the author's *Primary* and *Elementary Arithmetics;* for the full solution, see the author's *Written Arithmetic.*

Written Division.—The first lesson in written division consists in writing the elementary quotients as they are learned in the mental exercises; when he is familiar with these, he may take up written division proper. The fundamental principle in teaching written division is, that *short and long division should be taught together*, almost from the beginning. Let the pupils see that they are merely different ways of writing the results. It will be well even to have him express the *elementary quotients* by both methods. This will avoid the difficulty that pupils usually experience in making the transition from "short" to "long" division.

Course of Lessons.—The difficulty of teaching written division will be greatly lessened by a *careful grading* of the exercises.

1. Express the elementary quotients.
2. When there are several terms in the dividend and quotient, but when there are no remainders; as, 248 divided by 2.
3. When there are remainders, the divisor still not exceeding *twelve ;* as, 17 divided by 3.
4. When the divisor exceeds twelve; as, 156 divided by 13.
5. When there are one or more ciphers in the quotient; as, 3456 divided by 32.
6. When there are ciphers at the right of the dividend and then at the right of the divisor, and then at the right of both.

In the first three classes, the problems should be solved by both "short" and "long" division. In the fourth class, we must solve by "long" division. The divisors should be graded, beginning at 13, and passing on to 14, 15, 16, 17, etc. The difficulty which will now be met by the pupil is to ascertain the terms of the quotient. The teacher must lead him to test his quotient terms by the following considerations:

1. The pupil will notice that there are four steps in the operation; 1st, *Divide ;* 2d, *Multiply ;* 3d, *Subtract ;* 4th, *Bring down.*
2. If, when we multiply, the product is greater than the partial dividend, the quotient term is too large and must be diminished.
3. If, when we subtract, the remainder is not less than the divisor, the quotient term is too small and must be increased.

Explanation.—As in multiplication, the pupil should be required to do the work at first without giving explanation of the process. He should afterward be required to state the steps of the process without giving the reasons for the steps. When he is sufficiently advanced, he should be required to give a full logical solution, such as is found in the author's arithmetics.

The Grube Method.—There is a method of teaching the elementary sums, differences, products and quotients used in Germany, and highly recommended by a number of American educators, called the *Grube Method.* The principle of this method is, that it makes each individual *number*, instead of the *operations*, the basis of the instruction; and combines in each lesson, from the start, the four fundamental operations.

Thus, in treating any number, "all the operations possible within the limits of this number" are presented in the same lesson. That the method may be understood the lessons on a few of the first numbers are presented.

The Number 2.—The exercises on *Two* are as follows:

$2=1+1$; $2-1=1$; $2-2=0$.

$2=2\times1$; $2=1\times2$; $2\div1=2$; $2\div2=1$.

The Number 3.—The exercises on *Three* are as follows:

$3=1+1+1$; $3=2+1$; $3=1+2$; $3-1=2$; $3-2=1$; $3-3=0$.

$3=3\times1$; $3=1\times3$; $3\div1=3$; $3\div3=1$.

The Number 4.—The exercises on *Four* are as follows:

$4=1+1+$etc.; $4=3+1$; $4=2+2$; $4-1=3$; $4-2=2$; $4-3=1$; $4-4=0$.

$4=4\times1$; $4=1\times4$; $4=2\times2$; $4\div1=4$; $4\div4=1$; $4\div2=2$.

The Number 5.—The exercises on *Five* are as follows:

$5=1+1+$etc.; $5=4+1$; $5=3+2$; $5=2+3$; $5=1+4$; etc.

$5-1=4$; $5-2=3$; $5-3=2$; $5-4=1$; $5-5=0$.

$5=5\times1$; $5=1\times5$; $5\div1=5$; $5\div5=1$.

The Number 6.—The exercises on *Six* are as follows:

$6=1+1+$etc.; $6=5+1$; $6=4+2$; $6=3+3$; $6=2+4$; $6=1+5$; etc.

$6-1=5$; $6-2=4$; $6-3=3$; $6-4=2$; $6-5=1$; $6-6=0$.

$6=6\times1$; $6=1\times6$; $6=3\times2$; $6=2\times3$.

$6\div1=6$; $6\div6=1$; $6\div2=3$; $6\div3=2$.

The Number 7.—The exercises on *Seven* are as follows:

$7=1+1+$etc.; $7=6+1$; $7=5+2$; $7=4+3$; $7=3+4$; $7=2+5$; etc.

$7-1=6$; $7-2=5$; $7-3=4$; $7-4=3$; $7-5=2$; $7-6=1$; $7-7=0$.

$7=7\times1$; $7=1\times7$; $7\div1=7$; $7\div7=1$.

Similar exercises are presented on the numbers in regular order as far as 100 or 144, comprising the entire multiplication table with the corresponding quotients.

Experienced teachers of this method suggest that beginners should complete the exercises as far as 10 the *first year;* as far as 20, the *second year;* as far as 100 the *third year*, etc. Some teachers combine the *fractional parts* of numbers with the above exercises.

The nature of the Grube Method may be more clearly seen by comparing it with the Normal Method previously given.

1. The Grube Method makes *number* the basis of arithmetical instruction; the Normal Method makes *operations* on numbers the basis. The leading object of the former is to *comprehend* numbers; the object of the latter is to *use* or *operate* with numbers.

2. The Grube Method proceeds by *analysis* from a *number to its parts;* the Normal Method proceeds by *synthesis* from the *parts of the number to the number*.

3. The Grube Method requires the learner to comprehend and operate with the four fundamental rules from the beginning; the Normal Method teaches the two correlative processes of addition and subtraction together; and subsequently the two correlative processes of multiplication and division together.

4. The exercises of the Grube Method used in teaching addition, subtraction, etc., are used in the Normal Method after the pupil learns to add, subtract, multiply and divide.

NOTE.—Space does not permit a discussion of the relative merits of the two methods. An enthusiastic teacher who has faith in his method, will succeed in teaching the elementary sums, differences, products, and quotients with either. By the Normal Method these may be taught in a little more than a year; teachers of the other method usually devote three years to the subject.

IV. TEACHING COMMON FRACTIONS.

After the pupils are somewhat familiar with the fundamental operations, they are ready to begin the subject of Common Fractions. In teaching Fractions, the teacher should be guided by the following general principles:

Principles.—1. *The first lessons in fractions should be given orally.* No text-book is needed in teaching the primary ideas of the subject. The teacher should drill the pupils for several days before taking up the subject in the book.

2. *Mental and written exercises should be combined in the first lessons.* The order is, first the *idea*, then the *oral expression* of it, and then the *written expression* of it. As soon as the pupil has an idea of an operation, he should be taught to express it in written characters. The seeing of the operation will help to make it clear to the understanding and fix it in the memory.

3. *The elements of fractions should be taught by means of visible objects.* The pupil should be led to see the fractional idea and relation in the concrete, before he is required to conceive it abstractly. The objects to be employed are *apples*, *lines*, or *circles* on the blackboard, etc. An arithmetical frame, with long rods cut in sections, is used in the schools of Sweden, Prussia, etc.

4. *The operations in written fractions should be taught to young pupils mechanically.* They should be drilled upon the operations until they are thoroughly familiar with them, even before they understand fully the reason for such operations. This is in accordance with the principle that, *with young pupils, practice should precede theory.*

5. *The Methods or Rules in fractions should be derived by analysis and induction.* Special problems should be given for solution, and the *rules* or *methods* of operation be inferred from the analysis of these problems. The *principles* of fractions should be first illustrated rather than demonstrated. These principles should be committed, and the pupil should learn to apply them readily.

Things to be Taught.—The several things to be taught in fractions are as follows:

1. The idea of each fraction.
2. The fractional parts of numbers.
3. Solution of problems requiring the fractional parts of numbers.
4. The notation of fractions.
5. Analysis of concrete problems.
6. The cases of reduction of fractions, and their analysis.
7. Addition, subtraction, multiplication, and division of fractions.
8. The rules and the principles.

1. ***Idea of a Fraction.***—First, give a lesson on *one-half;* then on *one-third ;* then on *one-fourth*, etc., as far as *one-tenth.* The method is shown in the following model lesson :

Model Lesson.—If I divide an apple into two equal parts, what is one part called? What are two parts called? How many halves in a whole apple? What is one-half of anything? *Ans. One-half of anything is one of the two equal parts into which it may be divided.*

2. ***Apply to Numbers.***—The next step is to apply the fractional idea to finding the *parts of numbers.* This is a logical step in advance: the first step was to get a *part of a unit ;* now we pass to finding *parts* of *collections* of units. To illustrate, suppose we wish to obtain the one-half of 6. Show the pupil that *one of the two equal parts* of 6 is 3, hence 3 is one half of 6. We then proceed to obtain one-half of other numbers, from 2 to 24; then get *one-third* and *two-thirds* of numbers, also *one-fourth*, *two-fourths*, etc., of numbers, etc. The next step is to find the fractional parts of numbers which *do not give exact parts ;* as $\frac{1}{2}$ of 7, $\frac{1}{3}$ of 11, etc.

After the pupil has the idea, he should be required to give a simple solution of the process. Two forms of solution are suggested, one resting on multiplication, the other on division. The latter will be more convenient in practice, as in finding one-half, one-third, etc., of large numbers, we must divide them by two, three, etc. The thought is, that to find *one-half* of a number, we divide the number into *two equal parts.*

Model Lesson.—PROBLEM. What is one-half of 6? SOLUTION. One-half of 6 is 3, because 2 times *three* are 6. SOL. 2D. One-half of 6 is 3, because 6 *divided* by 2 is 3. *Illustration.* $6=3+3$; hence 3 is *one of the two equal parts* of 6, and 3 is therefore *one-half* of 6. We should also get *two, three,* etc., fractional parts of numbers. PROB. What are *two-thirds* of 6? SOL. *One-third* of 6 is 2, and *two-thirds* of 6 are two times 2, which are 4; therefore, two-thirds of 6 are 4. PROB. What is $\frac{1}{2}$ of 7? SOL. 7 equals $6+1$; $\frac{1}{2}$ of 6 is 3, $\frac{1}{2}$ of 1 is $\frac{1}{2}$, etc.

3. ***Concrete Problems.***—The next step is to apply these fractions to concrete problems. Thus, "If A has 6 apples and B has one-half as many, how many apples has B?" The pupil should be required to give a clear and simple solution.

Illustration.—PROB. If A has 6 apples and B has one-half as many, how many apples has B? SOLUTION. If A has 6 apples and B has one-half as many, B has one-half of 6 apples, or 3 apples. PROB. If I have 9 marbles and give 2 thirds of them away, how many will I give away? SOLUTION. If I have 9 marbles and give 2 thirds of them away, I give away 2 thirds of 9 marbles; one third of 9 marbles is 3 marbles, and 2 thirds are 2 times 3 marbles, or 6 marbles.

4. ***The Notation.***—The next step is to present the notation of fractions. This, in practice, may be done in connection with some of the previous exercises. The notation may be presented in two ways. The teacher may simply *state the method* of writing the numerator and denominator, and drill the pupils in writing until they can read and write fractions readily. By this method pupils will see no reason for the method, and, indeed, will not think to inquire after any reason. It will be purely arbitrary and conventional to them.

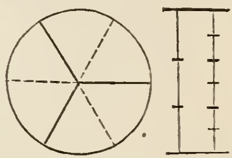
Another method is to lead the pupil gradually to the notation, somewhat as we may suppose it was reached historically. Thus, we may write some fraction, as 3-*fourths*, then abbreviate it to 3-4ths, then still further abbreviate by omitting the *ths*, giving 3-4; then represent it by separating the 3 and 4 by an oblique line, as $^3/_4$; and then let this line crowd the 4 down under the 3 and leave $\frac{3}{4}$. Or, we might have the name written under the numerator, as, $\frac{3}{\text{fourths}}$; then abbreviate it into $\frac{3}{4\text{ths}}$, and then again into $\frac{3}{4}$. Let the teacher illustrate.

5. ***Analysis.***—The next step is to apply the fractions in the analysis of two or three classes of concrete problems, as follows: 1. "If 2 apples cost 4 cents, what cost 3 apples?" 2. "What will 3 yards of ribbon cost, if $\frac{2}{3}$ of a yard cost 8 cents?" 3. "Six is $\frac{2}{3}$ of what number?" etc.

Illustration.—1. PROB. If 2 apples cost 4 cents, what cost 3 apples? SOL. If 2 apples cost 4 cents, 1 apple costs $\frac{1}{2}$ of 4 cents, which is 2 cents, and 3 apples cost 3 times 2 cents, which are 6 cents. 2. PROB. What will 3 yards of ribbon cost, if $\frac{2}{3}$ of a yard cost 8 cents? SOL. If $\frac{2}{3}$ of a yard cost 8 cents, $\frac{1}{3}$ of a yard costs $\frac{1}{2}$ of 8 cents, or 4 cents, and $\frac{3}{3}$, or 1 yard, costs 3 times 4 cents, or 12 cents; and if 1 yard costs 12 cents, 3 yards cost 3 times 12 cents, or 36 cents. 3. Prob. Six is $\frac{2}{3}$ of what number? Sol. If 6 is $\frac{2}{3}$ of some number, $\frac{1}{3}$ of the number is $\frac{1}{2}$ of 6, or 3, and $\frac{3}{3}$, or the number, is 3 times 3, or 9.

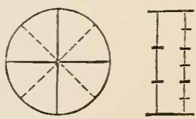
6. ***Reduction of Fractions.***—The next step is to present some of the simpler cases in the reduction of fractions. The several cases of Reduction are: 1. A number to a fraction; 2. A fraction to a number; 3. To higher terms; 4. To lower terms; 5. Compound fractions to simple; 6. To common denominator. We should present these cases first *concretely* by *illustration*, and then require the pupils to give a *simple solution* of the problems. We shall illustrate with a few of the simpler cases.

Illustration.—Take the problem, "How many sixths in $\frac{2}{3}$?" We may illustrate this by *circles* or *lines* on the board. In the first circle, we have *three* equal parts, and *two* of them are *two-thirds*. Dividing these *thirds* into *two equal* parts, we see that we have *six* equal parts, and each part is *one-sixth;* and we see that the *two-thirds* contain *four* sixths; hence, we see that $\frac{2}{3}$ equal $\frac{4}{6}$.



The same thing is shown with the two lines, in which the distance between the two parallel horizontal lines indicates the *unit*. By reversing this, we may illustrate how to reduce *from higher to lower terms.*

By a similar illustration we can show how to reduce a compound fraction to a simple one. To illustrate, take the problem, "What is $\frac{1}{2}$ of $\frac{1}{4}$?" Divide the circle into *four* equal parts; each part is *one-fourth.* To obtain $\frac{1}{2}$ of *one-fourth,* we must divide each *fourth* into *two* equal parts. Doing this, we find we have *eight* parts in the circle: hence each part is *one-eighth;* hence *one-half* of *one-fourth* is *one-eighth.* The line may also be used; the line in the margin illustrates finding *one-half* of *one-third.* The teacher should make constant use of these illustrations, and require the pupils also to illustrate the problems.



7. ***Analysis in Fractions.***—The pupils should learn the *analyses* of these cases of fractions. These analyses should be simple and concise. They are designed to state the steps of the judgment in obtaining the results required. In these an-

alyses, the unit is made the basis of reasoning; it is a centre around which the reasoning revolves. We present the analysis of a few of the cases.

CASE I. is to reduce *a number to a fraction*. PROB. How many fourths in $2\frac{3}{4}$? SOL. In *one* there are 4 fourths, and in 2 there are 2 times $\frac{4}{4}$ or $\frac{8}{4}$; and $\frac{8}{4}$ plus $\frac{3}{4}$ are $\frac{11}{4}$. CASE II. is the reverse of this. PROB. In $\frac{11}{4}$ how many *ones?* SOL. In *one* there are $\frac{4}{4}$, hence in $\frac{11}{4}$ there are as many ones as 4 is contained times in 11, which are $2\frac{3}{4}$. Another solution of this second case is as follows: In *one* there are *four* fourths; hence $\frac{1}{4}$ of the number of *fourths* equals the number of *ones;* $\frac{1}{4}$ of 11 equals $2\frac{3}{4}$. The first of these is much more easily understood by children.

CASE III. is to reduce *to higher terms*. PROB. In $\frac{2}{3}$ how many *sixths?* SOL. In *one* there are $\frac{6}{6}$, and in $\frac{1}{3}$ there are $\frac{1}{3}$ of $\frac{6}{6}$, or $\frac{2}{6}$, and in $\frac{2}{3}$ there are 2 times $\frac{2}{6}$, or $\frac{4}{6}$. CASE IV. is the reverse of this, to reduce to *lower terms*. PROB. In $\frac{4}{6}$ how many thirds? SOL. In *one* there are $\frac{6}{6}$, in *one-third* there are $\frac{1}{3}$ of $\frac{6}{6}$, or *two-sixths*, hence in $\frac{4}{6}$ there are as many *thirds* as $\frac{2}{6}$ are contained times in $\frac{4}{6}$, or $\frac{2}{3}$. This case also leads to the reducing to a common denominator, in which the analysis is like that just given.

CASE V. is the reducing *a compound fraction to a simple one*. PROB. What is $\frac{1}{2}$ of $\frac{1}{3}$? SOL. *One-third* is *one* of the *three* equal parts into which a unit is divided; if each third is divided into *two* equal parts, *three* thirds, or the unit, will be divided into *three* times *two*, or *six* equal parts, and each part will be *one-sixth* of a unit; hence $\frac{1}{2}$ of $\frac{1}{3}$ is $\frac{1}{6}$. ANOTHER SOLUTION. One-third equals $\frac{2}{6}$, and $\frac{1}{2}$ of $\frac{2}{6}$ is $\frac{1}{6}$; hence $\frac{1}{2}$ of $\frac{1}{3}$ is $\frac{1}{6}$.

The first solution is a little difficult for a beginner; but it involves precisely the mental process of obtaining $\frac{1}{2}$ of $\frac{1}{3}$, and is the one which should be used when a child is ready for an analysis. The second solution does not show why $\frac{1}{2}$ of $\frac{1}{3}$ is $\frac{1}{6}$, though it obtains the result. It may be used with the beginner, but it should be afterward followed by the other solution. A celebrated author of Mental Arithmetic gave the following solution: "One-half of one is $\frac{1}{2}$, and if $\frac{1}{2}$ of one is $\frac{1}{2}$, $\frac{1}{2}$ of $\frac{1}{3}$ is $\frac{1}{3}$ of $\frac{1}{2}$, which is $\frac{1}{6}$." The error in this logic is that to explain what is "$\frac{1}{2}$ of $\frac{1}{3}$." the author assumes he knows what "$\frac{1}{3}$ of $\frac{1}{2}$" is, the more difficult thing of the two.

8. ***The Other Cases.***—All the other cases of Fractions,—Addition, Subtraction, Multiplication, Division, and Relation of Fractions,—should be solved by *analysis*, as the pupils become able to understand them. The student-teacher should be required to show how to give the instruction. Illustrate both the inductive and deductive methods.

9. ***The Rules.***—The pupil needs to be able to derive results without going through the analysis each time, and for this purpose Rules should be drawn from these analyses. These may be derived by inference or induction. Thus, in reducing $2\frac{3}{4}$ to fourths, since in the analysis we take the product of 4 and 2 and add the 3, for the number of fourths, we may infer the rule, "To reduce a mixed number to a fraction, we multiply the integer by the denominator of the fraction, and add the numerator to the result," etc. The other rules of fractions may be derived in the same way. Another method is to derive them from the *principles* of fractions. The inductive method is easier for learners, and is preferred in primary arithmetic. With beginners, however, it may be well to teach the method of doing the work, without giving any reason for it; and subsequently, when they are familiar with the rules, they may learn to derive them. Let the student-teacher give examples of each case of fractions, and *show how to analyze the problems and derive the rules.*

10. ***The Principles.***—After pupils are somewhat familiar with these fundamental ideas and processes, they should be taught the *principles of fractions.* These principles may be *illustrated* so that the pupils may have a general idea of the manner in which they are derived, or pupils may be required to *commit* and *apply* them without any idea of how they are derived. A simple solution like the following may be given: "Multiply the denominator of $\frac{3}{4}$ by 2." SOL.—If we multiply the denominator of $\frac{3}{4}$ by 2, we have 3 *eighths*, which is *one-half* as much as 3 *fourths*, since *eighths* are only half as great as *fourths;* from which we infer that *multiplying the denominator by* 2 *divides the fraction by* 2. When the pupil is ready to understand the demonstration of the principles, a real demonstration should be given, and not some loose, indefinite statement, such as we find usually presented. For the more general demonstration, see the Treatment of Fractions in arithmetics.

The student-teacher should now be required to outline the course of instruction in Fractions in primary arithmetic, and show by model lessons how he would teach them.

V. Teaching Denominate Numbers.

Principles of Instruction.—In giving instruction in Denominate Numbers, teachers should be governed by the following principles:

1. *Denominate Numbers should be taught concretely.* The teacher should have the actual measures to illustrate the subject. If they are not in the school-room, the teacher can procure them at a trifling expense. In some text-books on primary arithmetic, we find *pictures* of the measures; but the *measures themselves* are worth much more than the pictures of them. In fact the pictures give an inadequate idea of the measures, and often an incorrect one. The neglect of this principle is very common. Most teachers have the pupils repeat the tables without any illustration of their meaning. The result is, that these "weights and measures" are to many pupils merely so many words without any corresponding definite ideas.

2. *The teacher should require the pupils to make a practical application of these measures.* He should drill them on measuring and judging of the length of rooms, the height of ceilings, the area of surfaces, the volumes of solids or vessels, the amount of land in fields, the amount of plastering in a room, the amount of carpet required to cover a floor, etc., etc. These measures will thus become actual and practical realities, and not merely a lot of names to be committed to memory.

Measures of Money.—In teaching the measures of Money, the teacher should show the pupils the *cent*, *dime*, *dollar*, *eagle*, etc. Every school should be provided with a collection of coins to illustrate the subject. There should be specimens also of the English *penny*, *half-penny*, the *shilling*, *sixpence*, *florin*, etc. In teaching French money, there should be specimens of the *franc*, *half-franc*, *five centimes* or *sou*, *ten centimes* or *two sous*. In teaching German money we should present to the pupil the *mark*, the *thaler*, the *groschen*, etc. The tables are also to be committed, written on the board, and repeated.

Measures of Weight.—In teaching the table of Weights, the pupils should be shown the different weights,—the *ounce*, the *pound*, etc.,— and be required to examine and handle them until they are entirely familiar with them. They should see and handle the *pennyweight*, the *ounce*, the *pound*, Troy; also the *scruple*, *dram*, *ounce*, and *pound*, Apothecaries. There should be a pair of scales in the school-room to weigh objects. Pupils should also be required to "heft" different objects, as a book, a chair, etc., to learn to judge of the weight of objects. The tables of weight should be studied and committed. We should also have specimens of the *gram*, *decagram*, and *kilogram*.

Measures of Length.—The teacher should give the pupil definite ideas of all the measures of length. There should be the *foot* and *yard* rules, divided into *inches*, *half-inches*, etc., Have the length of a *rod* marked on the wall or floor, show the pupils the distance of a mile, a half-mile, etc. Have a *meter* properly divided, show its relation to the yard, and give definite ideas of the *decimeter*, *centimeter*, etc. Pupils should also be drilled in estimating the length of objects, distances, heights of ceilings, of trees, etc.

Measures of Surface.—The teacher should mark on the board a *square inch*, *square foot*, and *square yard*, to show what is meant by these surfaces, and also to give definite ideas of them. Show also the reason why 9 sq. ft. make one *square yard*, and 144 sq. in. equal a *square foot*. Measure o f a *square rod* out in the field, and also an *acre*, and have pupils judge of the number of acres in a field. Have pupils remember that a square about 209 feet, or 70 paces on a side, is an acre. Teach the surfaces in the metric system in the same way. Have the pupils study and recite the table of square measure.

Measures of Volume.—The teacher should show the pupils a *cubic inch* and a *cubic foot*. He should draw them and also the *cubic yard* upon the blackboard. He should also, as clearly as possible, show the relation of them,—that is, that 27 cu. ft. equal a *cubic yard*, and 1728 cu. in. make a *cubic foot*—by a figure on the board, or by blocks prepared for the purpose. Give them an idea of a *cord* by taking a lot of little sticks 4 inches long, and making a pile 8 inches long and 4 inches high, and show them that a cord contains 128 cu. ft. To give them an idea of a *cord foot*, measure off 1 inch of the little cord, and run a thin stick or a piece of wire down, cutting off a part of the pile 1 inch long, which will represent a cord foot; they will thus see that 8 *cord feet* make a cord.

Liquid Measure.—In teaching Liquid Measure, have the measures in the school-room,—the *gill*, the *pint*, the *quart*, and the *gallon*. Show them by actual trial that 4 gills will fill a pint, 2 pints a quart, etc. Barrels and hogsheads can be seen at a store. We should also have samples of the Apothecaries' liquid measures in the school,—the *minim*, *fluidrachms*, *fluidounces*, etc.

Dry Measure.—In teaching Dry Measure, the *pint* and *quart* at least should be in the school-room. Have the pupils call at the grocer's to see the *peck* and *bushel*, or examine these measures at home, if their parents have them. They should also be led to compare the liquid quart and dry quart, etc. The metric system of measures should also be in the public school, and the pupils be drilled on them.

Measures of Time.—Time will be quite easily taught, as the measures are in such constant use. We should begin with the *day* as the most natural unit, and pass to the other measures. We should explain how nature fixes the *day*, and *month*, and *year*, and give the meaning of these terms. By means of a clock, we can teach the number of hours in a day, the number of minutes in an hour, and of seconds in a minute. The number of days in each month is best taught by the stanza, "Thirty days hath September," etc. This can also be remembered by the hand, the fingers representing January, March, May, etc., and the spaces between them representing February, April, June, etc. We should also show them that the calendar begins one day later each year, and two days later after a leap year, and explain the reason for it. When they are prepared to understand it, we can explain the reason for leap year, etc.

Circular Measure.—In teaching Circular Measure, draw a circle on the board, and teach the different parts—circumference, semi-circumference, quadrant, arc, etc. Then explain the division into 360 equal parts, each called a *degree;* that the semi-circumference contains 180°, and the quadrant 90°. Then show that the degrees are divided into 60 equal parts called *minutes*, and the minutes into 60 equal parts called *seconds.* Show that all these are *parts of the circumference*, that they are not of a fixed length, but differ in size with different circles. Call attention also to the difference between minutes and seconds of circular measure and of time measure.

A drill like this in Denominate Numbers will give the pupils definite ideas of what they are committing, and will make these tables a reality to them, and not a mere collection of abstract names. It will make them interesting to pupils and much more easily remembered than when taught in the usual abstract method of our schools. When the classes are more advanced, the many interesting facts concerning the tables—the origin of their names, of their units, etc.—may be presented.

CHAPTER IV.

TEACHING MENTAL ARITHMETIC.

AFTER completing the course in Primary Arithmetic, the pupil may take a complete course of Mental Arithmetic in one book, and a complete course of Written Arithmetic in another book; or these two courses may be combined in one book, as the teacher prefers. In this chapter we shall speak of the Importance of Mental Arithmetic, its Nature, and the Methods of Teaching it.

I. IMPORTANCE OF MENTAL ARITHMETIC.—Mental Arithmetic has become one of the most popular studies of the public school; in many places it has been the idol of the schoolroom around which have centered the affections of teachers, pupils, and parents. This preference is not a mere whim, but is founded on the intrinsic value of the subject, which we shall briefly consider. The value of Mental Arithmetic is two-fold; first, as a mental discipline, and second, as a means of cultivating arithmetical power.

Mental Discipline.—The science of numbers before the introduction of Mental Arithmetic, was far less useful as an educational agency than it should have been. Consisting mainly of rules and methods of operations, without leading the pupil to see the reasons for these operations, it failed to give that high degree of mental discipline which, when properly taught, it is so well adapted to afford. By the introduction of Mental Arithmetic a great change has been wrought in this respect; the spirit of analysis has entered into the science; and now the science of numbers presents one of the best, if not the very best, means of discipline in the curriculum of the common school.

1. *Mental Arithmetic gives culture to the reasoning facul-*

ties. No study in the school equals, surely none surpasses, Mental Arithmetic in giving exercise and development to the power of reasoning. It is a system of practical logic; all its processes are in accordance with the laws of thought; every step is a judgment direct or indirect; and the entire subject is permeated with the principles of logic. Its processes are analytic, and it thus trains the mind to the most rigid and severe analysis. Every truth is bound to every other truth by the thread of related thought; and the mind of the pupil becomes habituated to following a chain of logically connected judgments, until it reaches a desired conclusion. It is thus clear that Mental Arithmetic must be very valuable in giving culture to the power of thought.

2. *Mental Arithmetic cultivates the power of attention.* When properly taught, no study compares with Mental Arithmetic in this respect. The problem, as read by the teacher, must be repeated by the pupil, each number is to be remembered in its proper place, and each condition properly related; and this can be done only by the most careful attention. Pupils trained in this way acquire the ability to repeat long and complicated problems with ease and accuracy. Such discipline enables them to fix their minds upon a discourse and reproduce much of what they hear.

3. *Mental Arithmetic gives culture to the memory.* Memory depends upon the power of attention: we remember that which we fix in the mind by close attention; we forget that to which we are inattentive. Few persons, after hearing a sermon or discourse, can tell you anything definite concerning it, because they are careless and inattentive listeners. Anything that trains the mind to habits of close attention tends to give strength and reliability to the memory. Mental Arithmetic, therefore, in its discipline of the attention, is an important means of training the memory to habits of readiness and accuracy.

4. *Mental Arithmetic cultivates exactness of language.* It

is so rigidly exact in its processes of thought that it requires corresponding exactness in its language. The right word must be used in the right place, or the reasoning will be at fault. The language of Mental Arithmetic is simple, clear, and precise; and the mind, becoming habituated to such forms of expression, will naturally incline to use them in the consideration of subjects not mathematical.

5. *Mental Arithmetic sharpens and strengthens the mind in general.* The system of rigid analysis gives point and penetrating power to the mind, and enables a person to pierce a subject to its core and discern its elements. In this respect, Mental Arithmetic is a sort of mental whetstone which gives edge and keenness to the mind. Old Robert Recorde called his work on arithmetic the "Whetstone of Witte;" had he lived until the era of Mental Arithmetic, he would have seen the full meaning of his words, for mental arithmetic is indeed a whetstone of wit, a sharpener of the mental faculties.

It also strengthens the mind as well as sharpens it. The mind, like a muscle, grows tough by hard work; we toil for strength in study, as we do upon the playground or in the gymnasium. Mental Arithmetic is a mental gymnastics; through it the mind grows strong and tough, taking hold of difficulties with a will, laughing at obstacles, and rejoicing in the investigation of the intricate and profound.

6. *Mental Arithmetic prepares a pupil for extemporaneous speaking.* In solving a problem the pupil must stand up before his class, hold the conditions of his problem clearly in his mind, and proceed to develop the matter under consideration in logical forms of thought and expression. This is precisely the discipline needed to make a good extempore speaker. It also tends to correct the habit which many speakers have of talking without saying much. The good speaker is one who utters thought, and not words merely; and the study of mental arithmetic tends to cultivate speakers who think and utter thought.

Arithmetical Power.—The influence of Mental Arithmetic has been no less marked upon the science of arithmetic itself. Consisting heretofore of mechanical methods for finding results, it was dry, uninteresting, and difficult. Few pupils attained any excellence in it; and many acquired a positive distaste for the subject. But these things have passed away; a new era has dawned upon the science of numbers; a "royal road" to arithmetic has been found; and it has been so graded and strewn with the flowers of reason and philosophy that it is now full of interest and pleasure to the youthful learner. The agent that has produced this change is the method of analysis which we know as Mental Arithmetic.

1. *The study of Mental Arithmetic gives the pupil the power of independent thought in arithmetic.* The spirit of mental arithmetic is *analysis.* It is not merely oral arithmetic; it is analytical arithmetic; and in this consists its power. By it pupils become able to investigate for themselves, and are no longer bound down to the dictation of rules. "The rule says so," is no longer the touchstone of the science or the key to the result; but a careful comparison of the conditions of the problem will enable the pupil to make his own method and derive his own rule. By it he becomes, not a mere *arithmetical machine*, but an original thinker, understanding what he does, and prepared to make new investigations and new discoveries in the science. If we were obliged to choose between a course in mental and one in written arithmetic, we should take a complete course in mental in connection with the fundamental rules of written arithmetic; and we would turn out better-trained thinkers in arithmetic than if we had drilled them in the usual course of written arithmetic.

2. *The study of Mental Arithmetic is an excellent preparation for Algebra.* Arithmetic and Algebra are intimately related, algebra being a kind of general or symbolic arithmetic. The analysis of mental arithmetic is especially similar to the elementary reasoning of algebra, the main difference be-

ing that the latter employs symbols which render it more concise and general. The one insensibly glides into the other by the substitution of a symbol for a word; and it is thus evident that the study of mental arithmetic is a most valuable preparation for the study of algebra.

Its Great Value.—No words can convey a full appreciation of the importance of mental arithmetic. Only those who experienced the transition from the old methods to the new, can fully realize the supreme value of the study. Indeed, we believe that the method of mental arithmetic is the greatest improvement in modern education; and the world owes a debt of gratitude to Warren Colburn, its author, which it can never pay. Though there has been a recent reaction in public sentiment against the subject, we believe that it is merely a wave of opinion and cannot be permanent. Mental arithmetic is the great source of discipline to the power of thought in our public schools. When properly taught, it gives quickness of perception, keenness of insight, toughness of mental fibre, and an intellectual power and grasp that can be acquired by no other primary study. To omit, therefore, a thorough course in mental arithmetic in the common schools, is to deprive the pupils of one of the principal sources of thought power.

II. Nature of Mental Arithmetic.—In order to teach Mental Arithmetic properly, or to appreciate its value as an educational agency, its nature should be clearly understood. It is a popular view that mental arithmetic is merely the working of problems in the mind, and this is the opinion of many who oppose it as a distinct study; but this is a mistake, and one that should be corrected. The genius of mental arithmetic is not merely the "working of problems in the head," but the analytic and inductive treatment of the science of numbers. We shall attempt in a few words to explain its nature.

General Nature.—A system of Mental Arithmetic is developed upon the principles of *Analysis* and *Induction.* The reasoning processes are purely analytical, not demonstrative; and the methods of operation should be derived from these analyses by inference or induction. Each problem is resolved into its simple elements, and the relation of the elements, leading to the desired result, determined by comparison. When we wish to derive *rules* to apply to other problems of the same class, we notice the process generated by the analysis, and generalize this process into a rule.

This brief statement shows the philosophy upon which a system of mental arithmetic is founded. It is purely analytic and inductive; and not synthetic and deductive, like written arithmetic. Analysis determines the process in any particular case, and Induction derives the method that applies to all problems of the same class. Analysis and Induction are the golden keys which unlock the various complex combinations of numbers; they are the magic wands whose touch unfolds the mysterious and beautiful combinations of numbers.

Analysis.—Arithmetical analysis assumes the Unit to be the fundamental idea of arithmetic, and comprehends all numbers and their relations through their relation to the unit. It compares numbers and the effects produced by a number of equal causes through their relation to the unit or the effect of a single cause. It comprehends a fraction by a clear apprehension of the relation of the fractional unit to the integral unit; and thus develops the principles and methods of fractions. In this manner the whole science is evolved, presenting one of the most beautiful examples of pure logic that can be found in any science.

The simplicity and beauty of this process is seen in the fact that the unit is the fundamental idea of arithmetic. Arithmetic begins with the unit; all numbers arise from a repetition of the unit; fractions have their origin in the division of the unit. Hence, in the comparison of numbers the unit naturally becomes the basis of the reasoning process. We reason to the unit, from the unit, and through the unit. The unit is the foundation upon which we build ; it is the stepping-stone in the transition of thought ; it is the centre around which the process of reasoning revolves. In it we have an illustration of the general principle that the One lies at the basis of all things. All science is a striving after the *One* which contains the *All ;* the Cause which contains the phenomena, the Law which contains the facts, the one principle that binds all variety into unity.

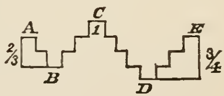
Comparing Integers.—In applying this analysis to numbers, we have three cases: First, where we pass from the *unit* to a *number ;* second, where we pass from a *number* to the *unit ;* and third, where we pass from a *number* to a *number.* In the first and second cases, the transition is immediately made, since the relation is immediately apprehended, being given in the genesis of numbers. In the other case, the comparison is not immediately seen ; it must therefore be made by the intermediate comparison of each to the unit. That is, in passing from a collection to a collection, or from one number to another, we first pass *to* the unit and then *from* the unit.

Thus, take the problem, "If 4 apples cost 12 cents, what will 5 apples cost?" Here the *cost of 4 apples* is the known quantity, the *cost of 5 apples* is the unknown quantity ; the object is to determine the unknown by comparing it with the known. This comparison cannot be made immediately, since the mind does not readily perceive the relation between *five* and *four;* we therefore pass from *four* to *one*, and then from *one* to *five.* Thus the analysis is: "If *four* apples cost 12 cents, *one* apple costs $\frac{1}{4}$ of 12 cents, or 3 cents; and if *one* apple costs 3 cents, *five* apples cost 5 times 3 cents, or 15 cents." This problem also illustrates the first and second cases of comparison.

Comparing Fractions.—With Fractions the same law holds as with Integers, though the existence of *two units*, the *integral unit* and the *fractional unit*, somewhat complicates the process. There are three distinct cases as in integers: (1) passing from an *integer to a fraction;* (2) passing from a *fraction to an integer;* (3) from a *fraction to a fraction.* In the first case, we pass to the *unit*, then to the *fractional unit*, and then to the *collection of fractional units.* In the second case we pass to the *fractional unit*, then to the *integral unit*, and then to the *collection of integral units.* In the third case we pass to the *fractional unit*, then to the *integral unit*, then to the *other fractional unit*, then to the *collection of fractional units.*

We give a problem of the third class, which includes also what in both of the others differs from the case of integers. Take the problem, "If $\frac{2}{3}$ of a yard of cloth cost 8 cents, what will $\frac{3}{4}$ of a yard cost?" The solution is as follows: "If 2 *thirds* of a yard cost 8 cents, *one-third* of a yard costs $\frac{1}{2}$ of 8 cents or 4 cents, and *three-thirds*, or one yard, cost 3 times 4 cents, or 12 cents; if *one* yard cost 12 cents, *one-fourth* of a yard cost $\frac{1}{4}$ of 12 cents, or 3 cents, and *three-fourths* of a yard cost 3 times 3 cents, or 9 cents."

Here the object is to compare $\frac{3}{4}$ with $\frac{2}{3}$, which we do by the intermediate relations of the units. It is as if one stood at A and wished to pass to E. The mind cannot step directly over from A to E, so it first steps *two* steps down to B, then *three* steps up to C, then *four* steps down to D, then *three* steps up to E.



Application of Analysis.—These analyses represent the spirit of Mental Arithmetic. Such processes of reasoning run through the entire science. The subject of Fractions, presenting many interesting cases, is beautifully unfolded by it. It can also be applied to problems in Simple and Compound Proportion Partitive Proportion, Medial Proportion, etc., giving simple and elegant solutions. The subject of Percentage and Interest is also developed by analysis with great simplicity and elegance.

Induction.—The office of Induction in Mental Arithmetic is to derive *methods of operations* or *rules* from the analyses. The object of these methods is to enable us to reach the result directly by a mechanical operation. instead of going through the process of analysis every time we need a result. Thus, suppose we wish to find a method of reducing fractions to *lower terms;* by analysis we reduce some fraction to lower terms, as $\frac{8}{12}$ equals $\frac{2}{3}$; and then, by examining the process or by comparing the two fractions, we can derive the rule for reducing a fraction to lower terms. The same thing can be done for all the many cases which arise in fractions.

Such inferences are necessary in Mental Arithmetic if we would attain any *methods* of operation, independent of the analyses. In Written Arithmetic these rules may be derived by demonstration; but no demonstration is appropriate to the spirit of Mental Arithmetic. To introduce demonstration in Mental Arithmetic would destroy or mar its analytic spirit, which is the distinctive characteristic of the branch. By the use of induction, the analytical spirit of the science is preserved, while it becomes practical in its methods and concise in its operations.

III. METHODS OF TEACHING MENTAL ARITHMETIC.—The course in Mental Arithmetic is so definitely laid down in our text-books, and the methods of instruction so clearly indicated, that but little need be said with respect to methods of teaching the subject. Only a few suggestions will be presented.

Pupils' Preparation.—Pupils in preparing their lessons should be careful to go through the form of analysis, making the clear expression of the reasoning the test of their knowledge of the lesson. To perform the mechanical operations necessary to attain the results is not sufficient. They may aid themselves, however, with pencil by writing out the solution, where it is long and complicated. The reducing of the solution to writing requires exactness of thought, and the seeing of the analysis will aid in fixing it in the understanding.

Pupils should be especially careful to depend upon themselves in solving the problems. The habit of a few pupils in the class working out the more difficult problems for the others, deprives the pupils assisted of the principal benefit of the study. A pupil should never be allowed to take the solution of another pupil or of the teacher and commit it to memory. It is better not to know how to solve a problem than to solve it with the memory.

The Recitation.—At the recitation, the teacher should read the problem and require the pupil to arise, repeat it, and give the solution. The pupil should not be allowed to use the book during recitation. The practice of some teachers of allowing the pupils to read the problems and solve them from the book is a needless and a pernicious one. The book is not needed in recitation by the pupils; a very little practice will enable them to reproduce long problems and hold the conditions in the mind with entire ease. More than half the benefit of the study is lost when the pupils solve with the book in their hands.

Pupils may be required to write out their solutions on paper or on the blackboard. This is especially convenient when the class is large, some being busy writing out the solutions, while others are reciting orally. The solutions as written should be not merely the operations, as in written arithmetic, but a complete analysis of the problem. Where the solution makes equational thought prominent, the form of writing may approximate that used in algebra.

Great care should be taken that the language of the solution be concise and accurate. The pupil should be required to say just what he means. The teacher should not accept his "O, that's what I meant," when he said something quite different. The singular and plural should be used as accurately as they can be in the language of arithmetic. We should insist also upon a uniformity of tenses in a solution, for pupils incline to get their tenses very much mixed in their forms of statement.

Methods of Recitation.—There are several different methods of recitation in mental arithmetic, which we shall name and describe. Some of these are preferred to others, but all may be used occasionally with advantage.

Common Method.—By this method the problems are assigned promiscuously, the pupils not being permitted to use the book during recitation, nor retain the conditions of the problems by means of pencil and paper, as is sometimes done. The pupil selected by the teacher arises, repeats the problem, and gives the solution, at the close of which the mistakes that may have been made should be corrected by the class and the teacher.

Silent Method.—By this method the teacher reads a problem to the class, and then the pupils silently solve it, indicating the completion of the solution by the upraised hand. After the whole class, or nearly the whole class, have finished the solution, the teacher calls upon some member, who arises, repeats the problem, and gives the solution, as in the former method.

In this method the whole class solves every problem, thus securing more discipline than by the preceding method. It, however, requires more time than the former method ; hence, not so many problems can be solved at a recitation. We prefer the first method for advanced pupils, and the second, at least a portion of the time, with younger pupils. It may also be used now and then for variety.

Chance Assignment.—This method differs from the first only in the assignment of the problems. The teacher marks the number of the lesson and the number of the problem upon small pieces of paper, which the pupils take out of a box passed around by the teacher or some member of the class. The teacher, then, after reading a problem, instead of calling upon a pupil, merely gives the number of the problem, the person having the number, arising, repeating, and solving it. By this method the teacher is relieved of all responsibility with reference to the hard and easy problems; and it is also believed that better attention is secured with it. It is particularly adapted to reviews and public examinations.

Double Assignment.—By this method the pupil who receives the problem from the teacher arises, repeats it, and then assigns it to some other pupil to solve. It may be combined with either the first or second methods. The objects of this method are variety and interest.

Method by Parts.—By this method, different parts of the same problem are solved by different pupils. The teacher reads the problem and assigns it to a pupil; and after he has given a portion of the solution, another is called upon, who takes up the solution at the point where the first stops; the second is succeeded in like manner by a third; and so on until the solution is completed. The object of this method is to secure the attention of the whole class, which it does very effectually. It is particularly suited to a large class consisting of young pupils.

Unnamed Method.—By this method the teacher reads and assigns several problems to different members of the class before requiring any solutions, after which those who have received problems are called upon in the order of assignment for their solutions. There are several advantages of this method. First, the pupil having some time to think of the problem, is enabled to give the solution with more promptness and accuracy; and, second, the necessity of retaining the numbers and their relations in the mind for several minutes affords a good discipline to the memory.

In regard to these methods, the first, second, and third are probably the best for the usual recitations; but the other methods can be employed very profitably with younger classes, or, in fact, with any class, to relieve monotony and awaken interest. With advanced pupils we prefer the first method, or the first combined with the third.

Errors to be Avoided.—There is a large number of errors to which pupils in every section of the country are liable, a few of which we shall mention. There are many words which pupils in their haste mispronounce, and also many combinations, which by a careless enunciation make ridiculous sense, or nonsense. We call the attention to a few of them, suggesting to the teacher to correct these and others he may notice.

"*And*" is often called "*an;*" "*for*" is called "*fur;*" "*of*" is pronounced as if the *o* was omitted; words commencing with *wh*, as when, which, where, etc., are pronounced as if spelled "*wen,*" "*wich,*" "*were,*" etc. "*Gave him*" is called "*gavim;*" "*did he*" is called "*diddy;*" "*had he*" is called "*haddy;*" "*give him*" is called "*givim;*" "*give her*" is called "*giver;*" "*which is*" is often changed into "*witches;*" and "*how many*" is frequently transformed into "*hominy.*" "How many did each earn" is often rendered "*hominy did e churn.*"

A very common error, and one exceedingly difficult to correct, is the improper use of *the* and *are;* as in the following solution: "If 2 apples cost 6 cents, one apple will cost *the* $\frac{1}{2}$ of 6 cents, which *are* 3 cents." Here "*the*" is superfluous, and "*are*" is ungrammatical. Pupils are so determined upon the use of "the" that we suggest the placing of a "*big the*" upon the board, and allowing the class to point to it every time the mistake occurs.

The following is a frequent error: "*If one apple cost* 3 *cents, for* 12 *cents you can buy as many apples as* 3 *is contained in* 12, *which are* 4 *times.*" The objections are, first, 3 is not contained any *apples* in 12; secondly, the result obtained is *times*, when it should be *apples*, or a *number* which applies to both times and apples. The solution should be, "*You can buy as* *many apples for* 12 *cents as* 3 *is contained times in* 12, *which are* 4."

With regard to *is* and *are*, it is not easy to determine which should be used in some cases in Arithmetic. It may be that it would be better to use the singular form always, whether the subject is an abstract or a concrete number; thus, 8 is 2 times 4, and 8 apples is 2 times 4 apples. But since custom sanctions the use of "*are*" with a concrete number as a subject, it is necessary to adhere to that form. There is some authority for using "is" in the "Multiplication Table," and it would be at least convenient if the singular form were universally adopted.

Pupils have some difficulty in knowing how to read such expressions as $\$\frac{4}{3}$. They object to saying "$\frac{4}{3}$ *dollars*," since there are not enough to make *dollars*, and they also object to saying "$\frac{4}{3}$ *of a dollar*," since there are only 3 thirds in a dollar. The second is undoubtedly a correct reading, remembering that $\frac{4}{3}$ is an *improper* fraction.

The following error is almost universal: "$2\frac{3}{4}$ apples" is read "2 *and* 3 *fourth apples*," instead of "2 *and* 3 *fourths apples*." The expression "$\frac{3}{4}$ *times*" is sanctioned by custom, although it is not strictly in accordance with grammatical principles. It is rather more convenient than the expression $\frac{3}{4}$ *of a time*, although evidently a violation of the rules of language

Conclusion.—The student teachers will now present a complete outline of the subject of Mental Arithmetic under the several heads: 1. Fundamental Rules; 2. Introduction to Fractions; 3. Treatment of Fractions; 4. Denominate Numbers; 5. Proportion; 6. Percentage and Interest; 7. Problems for Analysis. They should be able to state the different cases which arise, give a problem illustrating each case, and present a model solution. Let the teacher ever bear in mind that in teaching mental arithmetic, he should aim at the following objects: *Accuracy of memory*, *clearness of thought*, *simplicity of analysis*, and *conciseness and exactness of expression.*

CHAPTER V.

TEACHING WRITTEN ARITHMETIC.

IN connection with the course in Mental Arithmetic, there should also be a course in Written Arithmetic. This course may be combined in the same book, or presented in different books, as the teacher prefers. In this chapter we shall speak of the Nature of the Course, and the Methods of Teaching the subject.

I. NATURE OF WRITTEN ARITHMETIC.—Written Arithmetic differs from Mental Arithmetic in several respects. The object of Mental Arithmetic is the analysis of numbers; the object of Written Arithmetic is the attainment of skill in calculation. Written Arithmetic is a *calculus*, and the primary object is to learn to work with the Arabic system. The second object is the attainment of practical methods of operation, and the acquisition of readiness and accuracy in the use of these methods.

Method of Treatment.—The method of treatment in Written Arithmetic should be more deductive than that of Mental Arithmetic. The definitions which in Primary Arithmetic and Mental Arithmetic are given in the inductive form, should here be presented deductively. In the previous course the rules should be derived by induction from the analyses; but in Written Arithmetic the deductive method must also be employed. Here many things are to be demonstrated, and demonstration is a deductive form of reasoning. While analysis and induction are often used, yet the spirit of the science is deductive and demonstrative rather than analytic and inductive.

Arrangement.—The arrangement of the subjects in the text-book used should be both scientific and practical. By a scientific arrangement is meant such an order as the logical development of the subject suggests. By a practical arrangement is meant such an order as is best adapted to the wants of pupils in pursuing the study. A merely scientific arrangement, however satisfactory to the accomplished arithmetician, would not be sufficiently progressive to meet the purpose of instruction. A merely practical adaptation of the easy and difficult parts to suit the young learner, might completely ignore the logical relations of the science, and thus fail to give that mental discipline which the logical evolution of truth imparts. These two methods should run together; the work should be practically adapted to instruction, and at the same time the philosophical spirit of the science should be preserved.

The Gradation.—The course in Written Arithmetic should be carefully adapted to the different classes of pupils who use it. It should be simple enough for young pupils, and yet sufficiently advanced for those of more mature minds. This adaptation may be accomplished in two or three different ways. The first part of the work should be very simple, the difficulties gradually increasing as the pupil acquires strength and culture. The teacher may omit certain subjects with elementary classes until review, or until the pupil is prepared for them. Thus the more difficult matter will be left for the pupil until he will have become somewhat familiar with the easier principles and rules, and will have gained mental strength to cope with the greater difficulties. Another object gained by this plan, is the interest that new matter gives to a review.

The Reasoning.—In Written Arithmetic, as previously stated, the methods of reasoning are more synthetic and demonstrative than in Mental Arithmetic. Thus, many subjects which in Mental Arithmetic we treat analytically, in Written Arithmetic we should treat by demonstration; as may be seen in Fractions, Percentage, etc. Besides this, there are many subjects in Written Arithmetic which are purely deductive and demonstrative in their nature; as Proportion, Progressions, Evolution, etc. Hence, the pupil will be required to learn demonstrative reasoning as well as arithmetical analysis.

The Principles.—Arithmetic as a science involves, and as an art is based upon, certain principles; and the most important of these should be distinctly stated and clearly demonstrated. The form of statement should be deductive; and, when not too difficult, the method of demonstration should be deductive also. In other cases the truth may be shown inductively, suggesting to the pupil, however, that it is susceptible of rigid deductive demonstration.

Where the principles are essential to the development of a subject, they should be given at the beginning of the treatment of it; in other cases, they may be stated at the close of the subject. Thus, in Least Common Multiple, Greatest Common Divisor, Common Fractions, Proportion, etc., the principles are given first, and the development based upon them; in the Fundamental Rules, etc., a knowledge of some of the principles not being essential to the development of the subjects themselves, may be given after them.

The importance of principles in written arithmetic should not be overlooked. Until within a few years, American text-books and American instruction almost completely ignored the principles of the science, making arithmetic to consist entirely in the solution of problems. This is a great error, and one most pernicious in mental discipline. Especially is attention to principles important in Normal instruction, where the pupil expects to teach others. No matter how hard a problem he can solve, if he cannot give neat and clear explanations, he is unfit to be an instructor of others. It should be remembered also that a clear knowledge of the principle makes a problem, otherwise difficult, comparatively easy.

The Problems.—Problems are of two kinds, *abstract* and *concrete.* Abstract problems are designed to illustrate the principle, or fix the rule in the mind. They serve to make pupils ready and accurate in the mechanical operations. Such problems should be suited to the rule they illustrate and the capacity of the pupil, being simple at first, and gradually increasing in difficulty. Concrete problems are the application of the abstract principles to something that either does or may exist in actual life. These problems should also be adapted to the subject and the capacity of the learner. Simple at first, they should be gradually complicated until the pupil needs to think closely to unravel the complication and attain the result.

Number of Problems.—There should be a large number of problems in the course in Written Arithmetic. Principles and methods are fixed in the mind by their application, and problems are intended for such application. In this respect there is a great difference between the French and English works. The French have many principles and few problems; the English fewer principles and more problems. The true method is principles and problems, enough of the former, the more the better of the latter. Especially should there be a large collection of problems under the fundamental rules, as the first object in the study of arithmetic is to acquire skill in the mechanical processes of adding, multiplying, etc.

Variety of Problems.—Problems should be so varied that the solution of one cannot be directly and mechanically applied to all the others of the same class. This is an important point. Many teachers who condemn the faults of the old schoolmasters in working everything by rule, fall into a similar error by requiring pupils to solve everything by "*model solutions.*" To give a pupil a solution of one of a class of problems, and then have him apply it to a dozen others of the same class, without any variation or new complication of the conditions, so as to require original thought on the part of the pupil, is not much better than to solve by the old method of "*the rule says so.*" Problems should, therefore, be varied so as to give the pupil opportunity for original thought and investigation, that he may become an independent reasoner and not a mental parrot.

Practical Character.—The practical character of the problems should be a prominent feature of them. They should represent the *actual business of the day*, and not the scholar's idea of what business might be. The problems and processes should be derived from actual business transactions, and the teacher should endeavor to make this one of the leading characteristics of his instruction.

Solutions and Demonstrations.—The solutions and demonstrations should be simple and clear, that they may be readily understood, but at the same time concise and logically accurate. A solution may be too concise to be readily understood; and it may also be too prolix, the idea being smothered or concealed in a multiplicity of words. Both of these errors should be avoided. There is a language of arithmetical science, simple, clear, and concise, as appropriate to the science of numbers as the language of geometry is to the science of form. This language is the natural expression of the logical evolution of the subject, and should be employed even in the most elementary processes of arithmetic. The teacher should always remember that *the highest science is the greatest simplicity.*

The Rules.—The rules of arithmetic are statements of the methods of operation. These rules should be expressed in brief and simple language, and in a form easily understood by the learner. The statement should not be too general in its terms, but should indicate each step in its natural order. In most cases the rule should be derived from the solution of a problem, that the pupil may see the reason for it, and be able to derive it himself, as an inference from the solution. In some cases it is more convenient to state the rule first and then demonstrate it; and this should be done wherever it is seen to be preferable. Young pupils should not be required to commit the rule to memory, but they should be thoroughly drilled upon the methods of operation. Older pupils should be required to describe the methods of operation, and the study of the rules will aid them in doing this.

Definitions.—The definitions should be clear, concise, and accurate. There are two methods of giving definitions, which are distinguished as the Inductive and Deductive methods. By the Inductive method we pass from the idea to the word; by the Deductive method we pass from the word to the idea. Thus, by the Inductive method we would say, "The process of finding the sum of two or more numbers is Addition;" by the Deductive method we would say, "Addition is the process of finding the sum of two or more numbers." In the course in Primary and Mental Arithmetic, the Inductive method is preferred; in the Written Arithmetic, the Deductive method should be used.

Answers.—The question is often raised whether a text-book on Written Arithmetic should contain the answers to the problems. We believe that most of the problems should have no answers given in the text-book. In case of any peculiarity in a problem by which pupils would be liable to obtain an incorrect result, the correct answer should be given; in other cases it would be better to omit them. In practical life, our problems are without answers; we must determine the correct results for ourselves. Education should be disciplinary for life, hence the pupil should learn to rely upon himself in studying his text-book. We have no answers in Mental Arithmetic, and get along well without them; could we not do as well without them in Written Arithmetic?

These views, however, conflict with the popular view and practice. Nearly all teachers prefer having answers to the problems in the text-book; and with elementary classes they may be of some practical advantage, to both pupil and teacher. There are some teachers, however, who will not use an arithmetic with answers; and several authors publish two editions of their works, one with and the other without answers, so as to meet the wants of all in this respect.

II. Methods of Teaching Written Arithmetic. As conditions for thorough instruction in Written Arithmetic, each pupil should be provided with an arithmetic, slate, and pencil. In latter times book-slates and scribbling paper have in many places superseded slates, and are in some respects preferable to the old-fashioned slate. The school-room should also be furnished with a blackboard of suitable size and quality. The necessity of a blackboard in the school-room is imperative. No good teaching can be done without it, especially in mathematics.

Assignment of the Lesson.—The lesson should be assigned at the close of each recitation, that the pupil may have time to prepare it for the next recitation. In assigning the lesson the teacher should be definite as to place and extent, stating just where a lesson begins and where it ends, so that there can be no doubt about it by the pupil. The extent of the lesson should be adapted to the ability of the class, care being taken that neither too much nor too little be assigned. This point is important, for if too little be given, the pupils become lazy; if too much, they will become discouraged and disgusted with the study. Attention should also be called to prominent points or unusual difficulties, that they may receive special attention in the preparation of the lesson.

Preparation of the Lesson.—In the preparation of the lesson the pupil should be thrown, as far as possible, upon his own resources. The teacher should give him no assistance, or, at least, very little; and he should prevent, as far as possible, his obtaining any from other members of the class or the more advanced pupils. The habit of running to the teacher with every little difficulty is a most pernicious one, and destructive of invigorating mental discipline. Independence of thought and bold self-reliance are indispensable traits of man hood, and should be cultivated in the studies of youth, and especially in the study of mathematics, which is particularly adapted to give such training.

This point cannot be too strongly urged; its neglect has been productive of much mischief. We have known pupils who, for a whole session, scarcely ever solved a problem for themselves, but prepared their lessons with the aid of other pupils. At other times they have obtained notes from those who had previously passed over the same subject, and have used these notes to the utter neglect of self-thought. It is needless to say that much time was thrown away, and that such study is worse than useless. Let the pupil, in the preparation of his lesson, depend mainly upon himself; and what he fails to get out in this way, the teacher can explain to him at the recitation.

The Recitation.—The Recitation is the great instrument of instruction. In it the teacher comes in contact with the mind of the pupil, calls out its energies and moulds it to his will. Mind meets mind here—the pupil's mind and the teacher's mind—thought is evolved, and mental activity stimulated. It is here that the teacher shows his power as a teacher, rousing up dormant faculties, directing mental activity, and creating interest and enthusiasm in that which was before dry and repulsive.

The method of recitation must be determined by the several objects to be attained. These objects, briefly stated, are: 1. To find out what the pupil knows of the subject; 2. To fix the subject clearly in the mind; 3. To cultivate the power of accurate expression; 4. To impart instruction. These objects should be kept clearly before the mind of the teacher to direct and inspire his work.

Method of Recitation.—The lesson being prepared and the hour of recitation having arrived, the class take their seats in the recitation-room for the purpose of reciting. The teacher calls the roll to see if all are present, and then proceeds with the recitation, the most important points of which will be briefly specified.

Preparation of the Blackboard.—The first step is the preparation of the blackboard. The teacher says, "Prepare the board," and the pupils arise and pass orderly to the board, erase what work there may be on it, and then divide it into equal spaces by vertical lines, each pupil drawing a line to his right, and writing his name at the upper part of the space. This done, as quietly as possible, the pupils turn and stand with their backs to the board, and face towards the teacher.

Assignment of Problems.—The next step is the assignment of problems. With young classes the same problem should be assigned to all the pupils, or at least one problem to four or five pupils; with advanced classes each pupil should receive a different problem. If the class is not too large, the problem should be read by the teacher, and the pupil be required to copy the conditions as he reads. When the class is large, the pupils, or at least a part of them, may be permitted to copy the problem assigned from the book. They should be required, however, to close their books as soon as the conditions are written.

Writing the Problem.—The next step, or one co-ordinate with the above, is the copying of the problem upon the board. When the problem is abstract, merely requiring an operation upon abstract numbers, the pupil will copy such numbers as the teacher reads. If the problem is concrete, involving several conditions, the pupil should be required to mark the conditions by a sort of short-hand or abbreviated process which he can write rapidly, and which will be readily understood. He should also write the page and number of the problem at the upper part of his space, so that the teacher may readily refer to the problem in the text-book.

Working the Problem.—The next step is the working of the problem upon the board. In this the pupil should practice neatness and exactness. The figures should be plainly and neatly made. The lines drawn beneath any part of the work should be straight and horizontal. The work should generally be written in the form which a person would employ in actual calculation. It may sometimes be written in an analytic form, the operations and general form of solution being indicated by the form of writing. The pupil should be exact in such expressions, and not write one thing and mean another. Every point, symbol, etc., should be written in its proper place, the teacher not being satisfied by the pupil's saying he meant so and so, when he had written something else, or neglected writing some essential part. Having completed the solution of the problem, the pupil should take his seat and retain it until called upon by the teacher for his explanation.

Position at the Board.—In reciting, the pupil should stand in an erect and easy attitude, with the pointer in one hand and the other hanging down by the side. His side, and not his face, should be turned towards the board, so that he can see both the solution and the teacher. The teacher should be particular upon these points, allowing no awkwardness or clownishness of attitude, but endeavoring to cultivate an easy and graceful carriage. At West Point, one of the best mathematical schools in the country, they are very particular upon such points as these, and the effect of it is seen in the progress and attainments of the pupils.

Explanation.—The explanation of the problem should be given in a full and natural tone of voice, with great care in respect to clearness of thought, accuracy of expression, and distinctness of enunciation. Those who speak too low should be encouraged to speak louder; and those who speak in a loud and declamatory style should be taught to speak in a lower and more natural tone. If the form of solution is analytical, each point should be clearly stated as it follows a preceding one, care being taken that the whole chain of analysis be kept complete. If the solution is deductive, the different steps being based upon principles previously explained, these principles should be referred to in their proper order and connection. The explanation should be clear and full in all its parts, and complete as a logical whole.

Criticisms.—The pupils who are not engaged at the board should be required to observe closely each explanation, noticing carefully all mistakes in solution, expression, etc. At the close of the solution, the class should be called upon for correction of errors, suggestion of improvements, etc. The character of the solution, whether incorrect, too long, or not sufficiently clear, the form of statement upon the board, position at the board, style of expression, etc., are all legitimate subjects of criticism. After the pupils have given their criticisms, the teacher should present any other suggestions or corrections which may be required. At the close of such criticisms, the pupil who explained will erase his work upon the board, and receive another problem, or take his seat, and the next pupil proceed to explain.

Teacher's Explanation.—It is often necessary for the teacher to explain some principle or problem to the class; the proper time of doing this will be suggested by circumstances. A principle that several members of the class do not understand, and which is essential to the lesson to be recited, should be explained at the beginning of the recitation. A difficult problem should not be explained by the teacher until the class have tested their strength with it. It is better to leave it for a week or two, to see if the class cannot solve it without assistance. A spirit of this kind can be cultivated so that pupils will not be willing to have the teacher explain a problem until they have assured themselves, by severe labor, that it is beyond their powers. Assistance in this respect is often better given by suggestion than by full explanation. This leaves the victory partly theirs, and affords at least a partial satisfaction of a triumph.

New Matter.—For the purpose of exciting a deeper interest in the subject, the teacher should occasionally introduce new matter adapted to the comprehension of the class. This may be done at the latter part of the recitation hour, or he may occasionally occupy the whole period in a lecture upon the subject. This will give enlarged views of the subject, and awaken the desire of going beyond the limits of the text-book used. With classes sufficiently advanced, a philosophical discussion of the subject, showing its logical evolution from a few fundamental ideas, the relation of the different parts to each other, the natural transition from Arithmetic to Algebra, the historical development of some subject, etc., will be instructive and interesting.

Reviews.—We recommend regular reviews. With the younger classes, where they are learning merely the mechanical part, they need not be so frequent; but with other classes we suggest a review at the close of each week. In this review, less attention may be given to the problems, and more to definitions and principles. We should have pupils write analytical outlines of the week's work, embracing the definitions, principles, different cases under each subject, etc., in their logical order. This will give a comprehensive idea of the subject as a whole, and exhibit the logical relation of the parts to each other.

With these suggestions, we close the subject of arithmetical instruction, trusting that teachers may realize the full importance of the study, and may not only develop in their pupils the power of accurate and skillful computation, but train them to logical habits of thought and to a full appreciation of the beautiful science of numbers.

CHAPTER VI.

TEACHING GEOMETRY.

GEOMETRY is the science of Extension. Extension is possible only in space; hence geometry may also be defined as the science of Space. It investigates the properties and relations of the different figures that are possible in space. These figures have form; hence geometry treats of the forms of space, and has been defined as the science of Form.

Form is of two kinds, Pure Form and Real Form. Pure Form is a portion of space limited in thought, but not filled with content. Real Form is a portion of space filled with some material content. The science of geometry treats of Pure Form; but its principles may be applied to Real Form.

The term Geometry is derived from *ge*, the earth, and *metron*, a measure; and means literally a *measuring of the earth*, being equivalent to our term, *land surveying*. It does not appear, however, that it ever had simply this significance. As far back as we can trace the science, there seems to have been a body of truths designated by this term. Indeed, some of the principles of geometry must have been known from the very beginning of history.

Nature of Geometry.—Geometry is the science of Form. Its subject-matter is lines, surfaces, volumes, and angles. These general conceptions contain many special forms; the description of these forms gives rise to the *definitions* of geometry. When we consider these special forms of quantity, as well as quantity itself, we perceive some truths concerning them that are self-evident, that must be true, since they cannot be conceived as untrue. These self-evident truths are called the *axioms* of geometry.

The science of geometry begins with these primary ideas of space, and the self-evident truths arising out of them, and from these, as a basis, rises to the higher truths by a process of reasoning. The axioms and definitions are, therefore, said to be the basis of the science of geometry. The definitions present the subjects upon which we reason; the axioms give some of the truths with which we start, and also the laws which guide us in the reasoning process. From these we trace our way, step by step, to the loftiest and most beautiful truths of the science, by the simple process of comparison.

Geometry is purely a deductive science. It begins with definite ideas giving rise to strictly logical definitions, has its fundamental truths or axioms given by Intuition, and with these as a basis, proceeds by the logic of deduction to derive all the other truths of the science. It is regarded as the most perfect model of a deductive science, and is the type and model of all science.

Divisions of Geometry.—Geometry is divided into two branches; *Common* or *Synthetic Geometry*, and *Higher* or *Analytical Geometry*. Common or Synthetic Geometry is that which compares geometrical quantities, and derives their relations through the ordinary methods of reasoning. It is usually restricted to the use of the straight line and the circle; and includes the ordinary plane figures, the rectangular solids, and the three round bodies, the cylinder, the cone, and the sphere. Analytical Geometry is a method of applying algebraic analysis to the investigation of the forms of space. It is a general method of investigation that can be applied to all kinds of lines, surfaces, and volumes.

Origin of Geometry.—Geometry is generally supposed to have had its origin in Egypt, where the annual overflowing of the Nile obliterated the landmarks, and rendered it necessary to have recourse to mathematical measurement to re-establish them. This origin is indicated by the term Geometry, which, as stated, signifies the measurement of the earth. But, whatever may have been the origin of the term, the natural tendency of the human mind to compare things in respect to their forms and magnitudes is so universal, that a geometry more or less perfect must have existed since the first dawn of civilization.

Geometry, originating in Egypt, is supposed to have been introduced into Greece by Thales, who lived about the year 650 B. C. Pythagoras, who lived about 570 B. C., was one of the earliest Greek geometers. He is supposed to have discovered the following principles: 1. Only three plane figures can fill up the space about a point; 2. The sum of the angles of a triangle equals two right angles; 3. The celebrated proposition of the square on the hypothenuse. Some say that in honor of this last discovery he sacrificed one hundred oxen. Plutarch says but one ox; and Cicero doubts even that, as it was in opposition to his doctrines to offer bloody sacrifices, and suggests that they may have been images made of flour or clay.

The next geometer of eminence was Anaxagoras, who composed a treatise on the *quadrature of the circle.* Plato, the "poetical philosopher," delighted in the science, and cultivated it with great success, as is proved by his simple and elegant solution of the *duplication of the cube.* About fifty years after the time of Plato, Euclid collected the propositions which had been discovered by his predecessors, and formed of them his famous "*Elements*"—a work of such eminent excellence that by many it is regarded, even at the present day, as the best text-book upon the subject of Elementary Geometry. It consists of fifteen books, thirteen of which are known to have been written by Euclid; but the fourteenth and fifteenth are supposed to have been added by Hypsicles, of Alexandria.

Apollonius, of Perga, about 250 years B. C., composed a treatise on *Conic Sections*, in eight books. He is said to have given them their names, *parabola*, *ellipse*, and *hyperbola*. About the same time flourished Archimedes, who distinguished himself in Geometry by the discovery of the beautiful relation between the sphere and circumscribed cylinder. He is also distinguished by his work on *conoids* and *spheroids*, by his discovery of the exact *quadrature of the parabola*, and his very ingenious approximation to that of the circle.

Other geometers of eminence followed, among whom the most illustrious, perhaps, were Pappus and Diophantus; but the Greek geometry, though it was afterwards enriched by many new theorems, may be said to have reached its limits in the hands of Archimedes and Apollonius, and a long interval of seventeen centuries elapsed before this limit was passed. In 1637, Descartes published his Geometry, which contained the first systematic application of algebra to the solution of geometrical propositions. Soon after this followed the discovery of the infinitesimal calculus of Leibnitz and Newton; and from that time to the present, Geometry has shared in the general progress of all mathematical sciences.

Value of Geometry.—Geometry ranks among the first of all studies for the discipline of thought power. It is the perfection of logic, and excels in training the mind to logical habits of thought. In this respect it is superior to the study of Logic itself; for it is logic embodied in the science of form. While logic makes us familiar with the principles of reasoning, geometry trains the mind to the habit of reasoning. No study is so well adapted to make close and accurate thinkers. Euclid has done more to develop the logical faculty of the world than any book ever written. It has been the inspiring influence of scientific thought for ages, and is one of the corner-stones of modern civilization.

Geometry not only gives mental power, but is a test of mental power. The boy who cannot readily master his geometry will never attain to much in the domain of thought. He may have a fine poetic sense that will make a writer or an orator; but he can never reach any eminence in scientific thought or philosophic opinion. All the great geniuses in the realm of science, as far as is known, had fine mathematical abilities. So valuable is geometry as a discipline that many lawyers and preachers review their geometry every year in order to keep the mind drilled to logical habits of thinking.

Geometry is of value in all the sciences and arts. "It is," says Dr. Hill, "the most useful of all the sciences." "No other science," he adds, "can be learned unless you know geometry." It lies at the basis of the sciences of trigonometry, analytical geometry, and the transcendental analysis, while the sublime and far-reaching science of astronomy could not proceed a step without it. Without geometry, the sciences of surveying and engineering, with all their practical results, could have had no existence; and the mechanical skill that reared the pyramids or arched the dome of St. Peter's would have been impossible.

Things to be Taught.—The things to be taught in geometry are two-fold; *Geometrical Ideas* and *Geometrical Truths.* The Geometrical Ideas include the various elements; as *lines*, *surfaces*, *volumes*, and *angles.* These embrace all the different figures, triangles, quadrilaterals, the circle, polyedrons, cylinders, cones, and the sphere. The Truths of geometry are the Axioms and Theorems, the latter of which can be applied to the solution of practical problems.

The elements of geometry are simple and readily understood by children, and should thus be presented very early in the course of instruction. Many of the truths can also be easily understood and may be taught to young pupils. The reasoning of geometry requires considerable mental development, and cannot be understood by children: it should not, therefore, as a rule, be presented, before pupils are twelve years of age. We shall, therefore, for instruction, divide the subject into two parts; the Elements of Geometry, and Geometry as a Science.

I. The Elements of Geometry.

The Elements of Geometry include all such instruction as pupils are prepared for before they are ready to take up the subject as a science. These Elements embrace the fundamental ideas and truths of the science. The Ideas to be taught include a knowledge of all the figures of common geometry, their form, nature, parts, and the names of the figures and their parts. The Truths to be presented under the Elements include some of the axioms and some of the simpler theorems of the science.

Importance.—The importance of a course in the elements of geometry will be briefly stated. First, *a knowledge of geometry is adapted to the young mind.* One of the earliest ideas of the mind is that of form; objects present themselves to us in forms; and the mind naturally passes from concrete form to the conception of abstract or pure form. The mental product in perception is the *picture* of the object, a picture of its form; and the mind is thus prepared, from the beginning of its experience, to consider the subject of form.

Second, *the elements of geometry should be taught for their practical value.* The elements of geometry enter into all mechanical operations, and are of use in nearly every occupation. To omit such a course, as our common schools have been doing, is to send out into the avocations of life people ignorant of the simplest principles of mechanics. Such expressions heard among mechanics as a "long square," a "slanting square," a "square triangle," a "long circle," etc., show the defects of our common schools in respect to this branch. The common schools are fitting persons for every avocation; and they should give pupils at least the fundamental principles that enter into so many of the practical affairs of life.

Third, *instruction in the elements of geometry lies at the basis of drawing.* The simplest figures of the drawing lesson are the geometrical figures. Drawing should, therefore, begin in geometry; and the elements of geometry may be made a stepping-stone to the introduction of drawing into the public schools.

Fourth, *lessons in geometry will be of value in school discipline.* Pupils should be required to draw figures on their slates, and this will give employment to both minds and fingers, and keep them out of the mischief that comes from idleness. In this manner the teacher can reduce mischief into geometry, and thus interest and instruct little minds, and keep pupils obedient and quiet, because they are busy and happy.

Principles of Teaching.—There are several principles that determine the order and methods of teaching the elements of geometry, which we state briefly:

1. *The elements of geometry should precede the elements of arithmetic.* It has been customary to defer geometry until the pupil is quite familiar with the elements of arithmetic, but this is a great error in education. The elements of geometry are much easier than the elements of arithmetic. The ideas of number are much more abstract than the ideas of form. The child of four years of age can acquire but a very small knowledge of arithmetic, while it may learn to distinguish and name nearly all the ordinary geometrical forms.

2. *The reasoning of geometry should follow the reasoning of arithmetic.* Though the ideas of Geometry are simpler than the ideas of arithmetic, the reasoning of arithmetic is much simpler than the reasoning of geometry. The former is often a mere succession of intuitive judgments, each comparison bearing its evidence in itself; while the reasoning of geometry is syllogistic, depending on a principle of inference. For this reason the reasoning of geometry should not be introduced until the pupil has made considerable progress in arithmetic.

3. *The method of teaching the elements of geometry should*

be concrete. The pupil should see the forms, rather than learn to define them. Figures cut from pasteboard, models made out of wood, diagrams on the board, etc., should be extensively used in these instructions. Even the truths should be illustrated or presented in the concrete, rather than by abstract demonstration.

4. *The method of teaching should be inductive.* The pupil should be led to the idea of the different figures and to the different truths. He should be led to see the distinguishing characteristics of figures, the reason why they are named as they are; and in many cases he can be led to apply the appropriate term himself by appropriate questions.

I. THE GEOMETRICAL IDEAS.—The fundamental Ideas of geometry are those of the *Line*, the *Surface*, and the *Volume.* These elements may be reached in two ways, analytically or synthetically. We may begin with the idea of a *volume*, and pass from it to the *surface* and *line* as elements of it; or we may begin with a *point*, pass to the idea of a *line*, from the line to a *surface*, and from the surface to a *volume.* The former method is analytic; the latter is synthetic.

Analytic Method.—We may present the elements of geometrical quantity analytically as follows: The teacher may take some regular form, as a box, and call attention to it. He then takes a rule, and leads the pupils to see that it can be measured in *three directions;* in *length*, *breadth*, and *thickness.* He then tells them that these measurements are called the *dimensions* of the box, and leads them to see that it has *three dimensions*, length, breadth, and thickness.

The next step is to lead them to call it a *solid.* He leads them to call water, because it flows, a *fluid;* and because the hand will not move through the box, as through the water, we call the box a *solid.* He then leads them to conceive of the form of the box in space, and shows that the hand can move through this, therefore, this form is not a *solid;* from which they may see that the better term is *volume.* They may thus be led to conceive of form in pure space; which is the geometrical volume.

The next step is to teach the idea of a *surface*. The teacher leads them to call a side of a box the *surface*, and then measuring it, shows that a surface has *length* and *breadth*. He then asks how far they can see into the surface, and thus leads them to the idea that it has *no thickness*, but merely the *two dimensions*, length and breadth.

He then leads them to see that where two surfaces meet, since neither has any thickness, the edge will have no breadth nor thickness, but merely *length*; and that this is a *line*. In a similar manner, he may show that the end of a line has no length, breadth, or thickness, and is called a *point*. The student-teacher may be required to put this description into an inductive lesson.

Synthetic Method.—By the Synthetic Method, we should have a pupil conceive a *point* in space; then cause this point to move, and its imaginary pathway would be a *line;* then conceive this line to move in the direction opposite its length, and it will form a *surface;* then conceive this surface to move in a certain way, and its motion will form a *volume.*

This method is a legitimate one; the principle of it is employed in geometry in the case of the cylinder, cone, and sphere. The analytic method is preferred, however, for several reasons. It is more concrete than the synthetic method, as it begins with that which can be seen, and not merely conceived. The synthetic method begins with the most difficult geometrical conception, a *point*, which has no dimensions, but position only.

Lines.—The pupil has now the general idea of a line; the next step is to teach the *three kinds* of lines, the *straight*, the *curved*, and the *broken* line. To do this, take a small twig to represent a line; put it into different forms, leading them to name the forms, and then drawing lines to represent these forms, have them apply the names to the lines.

Model Lesson.—Teacher. When I pull this stick out *straight*, what kind of a stick is it? *Pupil.* A *straight* stick. *T.* If I draw a line like this on the board, what kind of a line is it? *P.* A *straight* line. *T.*, bending the stick, says, What am I doing to the stick? *P.* Bending it. *T.* When I have *bent* it, what kind of a stick is it? *P.* A *bent* stick. *T.* I will place this against the board and draw a line of the same shape; what kind of a line is it? *P.* A *bent* line. *T.* Very well; another name for this line is *curved* line *T.*, breaking the stick, says, What am I doing with the stick? *P.* *Breaking* it. *T.* When I have *broken* it, what kind of a stick is it? *P.* A *broken* stick. *T.* I will place it against the board, and draw a line like it on the board; what kind of a line shall we call it? *P.* A *broken* line.

The Angle.—The next step is to give the pupils an idea of an *angle*, and of the *several kinds* of angles. This may be done by taking some object, as a knife, opening it, then placing two straight sticks side by side, and making an *opening* like an angle, leading the pupils to call it an *opening;* and then giving the correct name, have the pupils define an angle. Lines on the blackboard may also be used.

Model Lesson.—Teacher, taking a knife and opening it, asks, What am I doing? *Pupils.* Opening your knife. *T.* The space between the blade and the handle may be called what? *P.* The *opening.* *T.* I will lay two sticks, the one on the other, and open them; what is the space between them called? *P.* An *opening.* *T.* Yes, that is right, but there is another name for it; this opening is called an *angle.* *T.* What then is an angle? *P.* *An angle is the opening between two lines.* The teacher will then make angles and require the pupils to make angles on the board.

Kinds of Angles.—The teacher will then lead the pupils to notice the difference between angles, to see that some are *sharp* and others *blunt;* and that these may be called *acute* and *obtuse.* Then lead them to see that there is one neither *sharp* nor *blunt*, and which, like a boy who is neither *too sharp* nor *too blunt*, is just *right*, and may therefore be called a *right angle.* The student-teacher will put this into a model lesson.

Parallels, etc.—We next teach *parallel* lines, *oblique* lines, *converging* lines, *diverging* lines, *perpendicular* lines, and *horizontal* lines. The method is simple; the student-teacher may describe it and give a model lesson.

The Triangle.—To teach the *Triangle*, give the children some little sticks, and have them make "little pens" with them. Tell them to make a pen with *five* sticks, then with *four*, then with *three*, then with *two;* and thus lead them to see that *three lines* is the least number that will enclose a surface. Then call attention to a figure made with three lines; ask how many angles it has; lead them to call the lines *sides;* then lead them to call it a "*three-side*," and then a "*three-angle*," and then introduce *tri*, and lead to the name *triangle*.

Kinds of Triangles.—Then lead them to see that triangles differ, and that the different kinds can be named from their angles and their sides. Then lead them to name the *right-angled* triangle, the *obtuse-angled* triangle, and the *acute-angled* triangle. Lead also to the different kinds of triangles with respect to their sides, and give them the names *equilateral*, *isosceles*, and *scalene*. Have them draw them on the board, and drill them until they are entirely familiar with them. Teach also the *base* and *altitude* of the triangle. The student-teacher will give an inductive lesson on the triangle.

The Quadrilateral.—Have pupils make a four-sided figure, lead them to name it from its angles a *four-angle*, give the word *quadra*, lead to *quadrangle*, its proper name. Then lead them to name it from its sides a *four-side;* introduce *lateral* for *side*, and *quadra* for *four*, and lead to *quadrilateral*. Then lead them to discover the three classes of *quadrilaterals;* and give the names *parallelogram*, *trapezoid*, and *trapezium*. Then lead them to discover the several kinds of *parallelograms;* the *rectangle*, *square*, *rhombus*, and *rhomboid*. The subject will admit of a beautiful inductive development, which the student-teacher will give.

Polygons.—We should then give a general lesson on *Polygons*, including the *pentagon*, *hexagon*, *heptagon*, etc. We should teach the meaning of *perimeter*, *area*, *regular* and *irregular polygons*, their division into triangles, etc.

The Circle.—We should next teach the *Circle*, including the *circumference*, *semi-circumference*, *quadrant*, *arc*, *diameter*, *radius*, *chord*, *sector*, *segment*, *tangent*, etc. We should show pupils how to construct the circle, and require them to draw and name the different parts. Attention may be called to the difference between the *circle* and the *circumference*, which are often confounded. The use of the circumference in measuring angles may also be explained, and the division of the circumference into degrees, minutes, and seconds. Pupils may also be taught to inscribe squares in circles, and circles in squares, etc. They may also be shown how to inscribe a regular hexagon by taking the radius as a side; and also how to form an inscribed triangle from the inscribed hexagon. The student-teacher will give a model lesson on the circle.

Volumes.—Among the Volumes we should first teach the *cube*, the *pyramid*, the *cylinder*, the *cone*, and the *sphere*, We next teach the *prism*, and the different kinds of prisms, named from the form of the bases. We should next teach the *oblique* and *right prisms*, the *parallelopipedons*, *rectangular parallelopipedons*, the *frustum* of a pyramid, *frustum* of a cone, etc. We should have models of these different volumes, and also draw them and show pupils how to draw them on the board.

Round Bodies.—We may then give a more detailed lesson on the three round bodies, the *Cylinder*, the *Cone*, and the *Sphere*. We may show that the cylinder can be generated by the revolution of a rectangle; explain which is the *base*, the *altitude*, and the *convex surface*. We may show how a cone can be generated by the revolution of a right-angled triangle about one of its sides, and explain the *base*, *altitude*, *slant height*, and *convex surface*. We may show how a sphere can be generated by the revolution of a semicircle around the diameter, and explain the *diameter*, *radius*, *convex surface*, *small circles* of the sphere, *great circles*, *spherical triangles*, *spherical polygons*, the *lune*, etc.

We mention in detail the things to be taught, so that young teachers may have a clear conception of the course suggested. They should be prepared on the subject themselves, and then know how to present it in an interesting manner. Let the student teacher be required to present a model lesson on each one of the figures.

II. THE GEOMETRICAL TRUTHS.—Children may also learn many of the truths of geometry as well as the ideas. The truths of geometry are of two kinds; those that are self-evident, called *axioms*, and those that are derived by demonstrations, called *theorems*.

Many of the self-evident truths of geometry are readily understood by young pupils. Many of the theorems may be illustrated or presented by what might be called a *concrete demonstration*. An abstract or logical demonstration of them would be too difficult for children, and nothing of the kind should be attempted. Some of the other truths which cannot be illustrated may be taken *on faith*; the pupils accepting them, not because they can see a reason for them, but because the teacher tells them they are true.

Self-evident Truths.—Little children may readily be led to see that "A straight line is the shortest distance from one point to another." Unite two points with a straight line, a curved line, and a broken line, and they will see by intuition that the straight line is the shortest route. To make it interesting, have them suppose three little boys start from the same point to travel on three lines, and they will readily see which has the shortest road to travel. The ancients used to say that a donkey knew that one side of a triangle was shorter than the sum of the other two sides, for he would go straight across from one corner of a field to the other, rather than follow the two sides of the field.

They may also be taught to see that "two right angles are equal to one another." Care should be taken that they see that the size of the angle depends on the extent of the opening, and not on the length of the sides. They may also readily see that "the diameters of the same circle are all equal;" that "the radii are all equal;" that "the radius is half the diameter," etc. In fact, they may be taught nearly all the geometrical axioms. The student-teacher will present the lesson.

Truths by Concrete Demonstration.—Many of the truths of geometry can be taught by *concrete demonstration.* That is, they may be illustrated in such a way that pupils can be assured of their truthfulness without depending upon the statement of the book or the teacher. We will give a list of such theorems, and suggestions for their illustration.

1. *If one straight line meet another straight line, the sum of the two adjacent angles equals two right angles.* Take two straight sticks, A and B; place the end of A near the middle of B, perpendicular to it; then will be formed two right angles. Then incline the stick A, and the pupil can see that one angle loses what the other gains, and that they both just fill up the space of two right angles, and hence are always equal to two right angles. Illustrate the same also on the board.

2. *All the angles formed on one side of a straight line by drawing lines from the same point, are equal to two right angles.* This can be shown as in the previous theorem, and the pupil may illustrate it on the board.

3. *The sum of the three angles of a plane triangle is equal to two right angles.* To illustrate this, cut out a triangle from stiff paper of any form; then cut off two of the angles, and place one on each side of the third angle, and it will be found that they just fill up the angular space of two right angles.

4. *If two triangles have two sides and the included angle of one respectively equal to two sides and the included angle of the other, the two triangles are equal.* To show this, cut out of paper a triangle of any shape; then mark out on another piece of paper two sides and an included angle equal to those of the given triangle, then draw a straight line uniting the

extremities of the sides, cut out the triangle, and compare them by placing one on the other, and it will be found that they exactly coincide.

5. *The area of a rectangle equals the number of units in the base multiplied by the number of units in the altitude.* Take any number of square blocks, as *five*, and pile them up in *three* rows of *five* each, forming a rectangle. The whole surface of the rectangle is formed by the one side of the square blocks, and since there are 5 in a row, and 3 rows, there are 3 times 5, or 15, in all; hence the product of the number of units in the base multiplied by the number of units in the height, will give the whole number of square units in the surface. Illustrate it also on the blackboard.

6. *The area of a parallelogram is equal to the product of the base and altitude.* Cut out a paper parallelogram, cut off one corner vertically across; put this triangle on the other end of the parallelogram, and it will become a rectangle. Now the surface of this rectangle is precisely the same as the surface of the parallelogram, and its base and altitude are the same. But the area of this rectangle is equal to the product of the base and altitude; hence the area of the parallelogram is equal to the product of the base and altitude.

7. *The area of a triangle equals the product of the base by half the altitude.* Cut out a parallelogram; then divide it into two triangles, cutting across from one corner to the other. These two triangles are equal, and hence equal to one-half of the parallelogram, and hence to one-half of the product of the base multiplied by the altitude.

8. *The area of a trapezoid is equal to the sum of the two parallel sides multiplied by half the altitude.* This can be shown by cutting out a trapezoid, dividing it into two triangles, showing that the area of each equals its base into one-half of its altitude, and that their sum will be the sum of the two bases into one-half of the altitude.

9. *The square on the hypothenuse of a right-angled tri-*

angle is equal to the sum of the squares on the other two sides Make a right-angled triangle on the board, one side 3 and the other side 4, the hypothenuse will be 5; construct squares on each, and divide them into small squares; the square on one side will contain 9, that on the other 16, and that on the hypothenuse 25; and 25 we see is the sum of 9 and 16. Here we see that the square on the hypothenuse is equal to the sum of the squares on the other two sides.

Many other truths can be taught in this way; and such a concrete consideration of the subject will be a valuable preparation for the study of the subject abstractly. Let the student-teacher give a lesson on each one of these, using paper and the blackboard.

III. TRUTHS TO BE TAKEN ON FAITH.—We should teach the pupils of the common school some truths that cannot be illustrated to them. Such truths they may take on faith; pupils believing them as they do the facts of geography and history, because the teacher states them as true. This instruction may extend to curves not treated of in ordinary geometry, including the Parabola, the Ellipse, the Hyperbola, the Cycloid, the Catenary, etc.

In Ordinary Geometry.—It will be well to teach the more advanced pupils how to find the circumference of the circle by *multiplying the diameter by* 3.1416, to find the area by *multiplying the circumference by half the radius;* that *an angle at the centre is measured by the arc included between its sides;* that *an angle at the circumference is measured by one-half the arc included between its sides;* how to find *the volume of a prism*, the *convex surface* and *volume* of a *cylinder*, the *volume* and *convex surface* of a *pyramid* and a *cone*, the *surface* and *volume* of a *sphere*. These should be introduced as they are prepared for them, the pupils being drilled on their application, but no attempt being made to explain the reason for them.

The Parabola.—If a cone be cut by a plane parallel to its slanting sides, the section formed is a beautiful curve called a *Parabola.* This is a very interesting curve. Every stone that a little boy throws at an object forms a parabola in its flight. In a snow-balling match, all the balls form parabolic curves; and in a battle, shot and shell go humming and screeching through the air in parabolic arcs. It may be well to show that the *area of a section* of this curve is two-thirds of the *base multiplied by the altitude.* This area may be compared with the area of a rectangle and triangle of the same base and altitude. The method of constructing a parabola should also be given.

The Ellipse.—If a cone be cut by a plane making an angle with the base less than that made by the side of the cone, the result will be a closed curve that looks like a circle drawn out. Such a curve is called an *Ellipse.* This curve can be made by driving two pins in a board, and tying a string at each end to one of these pins, and then putting a pencil point inside the string, stretching it out and moving it round. A doubled string passed around the pins is still better. The two points at the pins are called the *foci* of the ellipse. The point between these is the *centre*, a line through the foci is called the *major axis;* and a line perpendicular to this through the centre is the *minor axis.*

The ellipse is also an interesting curve. The earth in its march around the sun follows a pathway of the form of an ellipse, the sun being in one of the foci of the elliptical orbit. The moon moves around the earth in an ellipse, and all the planets and satellites move in the same curve. To find the area of an ellipse, we *multiply the half of the two axes together, and that product by* 3.1416. Another interesting fact is that if we had a mirror in the form of an ellipse, a light placed at one focus would have its rays all reflected in the other focus; and if we had a whispering gallery in this form, a whisper at one focus would be distinctly heard at the other focus.

The Hyperbola.—If a cone be cut by a plane making a larger angle with the base than the slanting side makes with it, the curve formed is an *Hyperbola*. If we tie strings at different points of a horizontal wire, and draw them all through a point below the wire and cut them off at the point, when they hang down straight their ends will form an hyperbola. If we tie threads to each link of a hanging chain, and cut off their ends in a level line, and then draw the chain out horizontal, the lower ends of the threads will form an hyperbola. There are many interesting truths concerning the hyperbola.

The Cycloid.—If a wagon wheel roll on a level floor, a nail in the tire or rim will make a series of curves, each called a *Cycloid*. A boy can make a cycloid by fastening a pencil to a spool and rolling the spool slowly against the inside of the frame of his slate. There are several interesting properties of the cycloid.

1. The height of the cycloid at the middle is equal to the *diameter* of the wheel or circle which formed it. 2. The length of the straight line joining the two ends of the curve, called the *base*, is equal to the *circumference* of the generating circle. 3. The length of the curve is *four times the diameter* of the generating circle. 4. The area of the curve is equal to *three times the area* of the generating circle. When the circle is at the middle of the cycloid, the curious looking three-cornered figures on each side of the circle are each exactly as large as the circle itself.

5. If a cycloid is turned upside down, a ball will roll down it quicker than on any other curve: for this reason the cycloid is called the *curve of swiftest descent*. If a hill were hollowed out in the form of a cycloid, a sled would run down it faster than if it were of any other shape.

6. Another curious property is that if several balls start at different points on the curve at the same moment, they will all reach the bottom at the same time; so that it is also the *curve of equal descent*.

The Catenary.—When a chain hangs from two posts, it makes an interesting curve, called a *Catenary*. A jumping rope, a clothes-line, and a gate chain, all hang in the form of a catenary. The curve was first noticed by Galileo, who thought it was the same as the parabola. Its true nature was first demonstrated by James Bernoulli. This curve has also several curious properties.

1. If the chain were made of a great many short pieces of wood or metal hinged together by rivets, like the inside chain of a watch, and we could turn it up in the same form it has when it hangs, it would stand up without falling in, and be a catenary upside down. This is the only curve that possesses this property. 2. If we wish to make the strongest possible arch for a bridge, we should make it in the form of a catenary.

For other facts in the elements of geometry, see *First Lessons in Geometry*, by Dr. Thomas Hill, a valuable little book.

II. Geometry as a Science.

The previous course in the elements of Geometry is designed as an introduction to the study of the subject as a science. By means of it, pupils will become familiar with the leading ideas and truths of geometry, and thus be prepared for a more intelligent study of the science when of a suitable age. Pupils may begin the study of geometry as a science when about thirteen or fourteen years of age.

I. The Nature of the Study.—The study of Geometry as a science includes *Definitions*, *Axioms*, *Postulates*, *Theorems*, *Demonstrations*, *Problems*, *Solutions*, and *Applications*. We shall speak of the nature and methods of teaching each of these, and also of the method of hearing a recitation in geometry.

Definitions.—The *Definitions* of geometry are statements of the ideas of the science, or a description of the quantities upon which we reason. They are examples of what are known as *logical definitions;* that is, they define by *genus* and *differentia*, or specific difference. Thus, in the definition, "A triangle is a polygon of three sides," *polygon* is the generic term, and *three sides* is the differentia or specific difference. No science presents so many fine examples of logical definitions as geometry.

These definitions should be expressed in the deductive form; that is, we should begin with the term to be defined, and pass to genus and differentia. The definitions should be stated positively, not negatively, telling what a thing is, and not what it is not. Thus, the old definition, "A straight line is one that does not change its direction," etc., is not so satisfactory as the positive one, "A straight line is one that lies in the same direction," etc.

How Teach.—In teaching the definitions, the first requisite is that the pupils have a clear notion of the thing defined. They should be required to give an illustration of each definition in which there may be the least difficulty. This point is important, as pupils are often found trying to reason from a definition when they have no clear idea of the quantity defined. It is especially necessary with pupils of good memory, who are apt to rest satisfied with a form of words without taking the trouble to see clearly what is meant by them.

Care should be taken to see that the definitions, as given by the pupil, are strictly accurate. The language of the author should be insisted upon, unless the teacher or pupil can improve the definition, which, in such a science as geometry, will be seldom possible. Most of the definitions are classic with culture and age, and have become fixed in form, and will not admit of improvement. It is an excellent exercise to show, by question and illustration, the importance of the prominent points of a definition, and how any departure from the statement will vitiate the correctness of the definition. A proper study of the definitions of geometry may be made a source of excellent mental discipline.

Axioms.—The *Axioms* of geometry are the self-evident truths which pertain to the subject. These truths lie at the basis of the science; they are the foundation upon which all the other truths rest. They express the fundamental and necessary relations of quantity, and depend for their existence on no truths which lie behind them. These truths are intuitive; they are not the result of reasoning. The mind is so constituted that it knows them to be true upon the mere announcement or contemplation of them, and neither asks nor needs any proof of them.

Two Kinds.—There are two kinds of axioms in geometry; those which pertain to quantity in general, and those which grow out of the particular quantity considered. Examples of the former class are, "Things that are equal to the same thing are equal to one another;" "If equal quantities be equally increased or diminished, the results will be equal." These apply to arithmetic and algebra, as well as to geometry. Examples of the second class are, "All right angles are equal to one another;" "The radii of a circle are all equal." These arise out of the particular kind of quantity considered, and apply only to geometry.

Their Use.—The use of axioms in reasoning, as usually stated, is that they are *general truths which contain all the particular truths of the science.* According to this view, the geometer needs only to analyze the axioms, and he will find in them all the truths of the science. In reasoning, he only unfolds these general truths and evolves the special truths which he finds contained in them. This view of the subject admits of question. It may be pleasant for one to suppose that when he knows the axioms of a science, he has in his mind, potentially if not actually, the entire science; but it does not seem to express a scientific truth. A *general formula* may truly be said to contain many *special truths* which may be derived from it; but no axiom in this sense can be named that contains the other truths of geometry.

Another view is that *axioms are the laws which guide us in reasoning:* they are the *laws of comparison or inference.* Thus, if we wish to compare A and B, seeing no relation directly between them, we may compare each to C; and proving that they are both equal to C, we infer that they are equal to each other. The law that governs this comparison, and enables us to make the inference, is the axiom, *Things that are equal to the same thing are equal to one another.* So in comparing parts of the circle, we must always bear in mind the truth that the *radius is half of the diameter;* but it cannot be truly said that this axiom contains other truths.

It is also true that an axiom may be one of the premises of a syllogism from which a conclusion is drawn. Thus in a demonstration we may see a line A equal to a radius B of a circle, but radius B is equal to radius C of the same circle; therefore, this line A is equal to radius C. In this case the axiom of equal radii is neither a general truth containing other truths nor a law of reasoning. Axioms may thus perform several offices in a demonstration; but they are always first truths, beyond which we cannot go in thought.

How Teach.—In teaching the axioms, the pupil should be required to give an exact statement in the language of the book, unless it can be improved. No awkward or half-way statement should be accepted as satisfactory. He should also be required to illustrate the axiom, that the teacher may be sure he has a clear conception of the truth he is stating.

Postulates.—An axiom may be defined as a self-eviden' theorem. A self-evident problem is called a *Postulate.* Thus it will be granted that "a straight line may be drawn from one point to another," or that "two lines may be constructed equal to each other." The postulates bear the same relation to problems that axioms do to theorems. The same remarks will apply to the teaching of them that we have already made with respect to teaching axioms.

Reasoning.—All reasoning is the comparison of two ideas through their relation to a third. Thus, suppose I see no relation between A and B, but upon looking at a third quantity, C, I perceive that A equals C, and also that B equals C; and I can then infer that A equals B. I thus compare A and B through their common relation to the third quantity, C; C thus stands intermediate between A and B, and the process is called a process of mediate or indirect comparison.

This is the general nature of the reasoning of geometry. In its application to geometry reasoning assumes two different forms, which may be distinguished as the *analytic* and *synthetic* methods. The analytic method is adapted to the discovery of truth; the synthetic method is used in proving a truth when it has already been discovered.

Synthetic Method.—The Synthetic Method of proving a truth already known is called *demonstration*. Demonstration begins with self-evident truths or truths already proved; and passes, step by step, to the truth to be proved. There are two distinct methods of demonstration. The simplest form is that in which figures are directly compared by applying one to another. This is called the method by *superposition*. It is used in proving the equality of polygons and also of some of the volumes. The more general form of demonstration is that in which truths are proved by a reference to the definitions and axioms, or to some principle previously proved.

Analytic Method.—The Analytic Method begins with the thing required, and traces the relation between the various elements, till we arrive at some known truth. It is a kind of going back from the result sought, by a chain of relations, to what has been previously established. In the synthetic method, we pass through every step, from the simplest self-evident truth to the highest truth of the science. In the process of analysis, we pass over the same path, descending from the higher truths to the simpler and fundamental truths.

Analysis is the method of discovery; synthesis is the method of presentation. The one has for its object to find unknown truths; the other to prove known truths. Frequently both methods are employed simultaneously, when the object is to discover new theorems, or to find the solution of new problems; but when we wish to prove to others the truths already known, the synthetical method is usually preferred.

Reductio ad Absurdum.—There is a form of reasoning which is analytic in its character, known as the *reductio ad absurdum.* It consists in supposing that the proposition to be proved is not true, and then showing that such a hypothesis leads to a contradiction of some known truth. This proves a theorem to be true by simply showing that it cannot be false. The method is frequently used to prove the converse of a proposition, when there is no good direct method; it is also used in treating incommensurable quantities.

This method of reasoning is also called a demonstration, and is called the *Indirect Method*, to distinguish it from the other, which is called the *Direct Method.* The indirect method is not considered as satisfactory as the direct method, and should never be used except when no good direct method can be found.

Errors in Reasoning.—There are two errors in reasoning into which young geometricians are liable to fall. The first is called *Reasoning in a Circle;* the second is called *Begging the Question.* We *reason in a circle*, when, in demonstrating a truth, we employ a second truth which cannot be proved without the aid of the truth we are trying to demonstrate. We are said to *beg the question*, when, in order to establish a proposition, we employ the proposition itself.

Practical Problems.—A radical defect of most of our text-books on geometry is that they present the subject so abstractly that when the pupil has completed his course, he is often unable to make any practical application of what he has learned. This defect can be supplied by requiring the pupils to apply the principles of the science to *practical examples.* Such applications will show them the use of the principles.

and they will thus understand it better and remember it longer. They will also place a higher value on the science on account of their being able to apply their knowledge to some practical purpose. These applications will also add an interest to the study that it cannot possess by the purely abstract method. Every text-book in geometry should be supplied with a large collection of *practical examples.*

Undemonstrated Theorems.—Another defect in the teaching of geometry has been the lack of matter for *original thought.* The study as usually pursued does not give training to the inventive powers of the student. He is required to learn the demonstrations of the text-book, but he has no undemonstrated theorems to test his own geometrical powers and to train him to reason independently of the text-book. To remedy this defect, he should be given a collection of *theorems for original thought*, and be required to try his powers of reasoning in finding out the demonstration for himself.

These theorems should be easy at first, and gradually increase in difficulty as the pupil gains strength for the work. They may be mingled with the propositions of each book (geometry is usually divided into a number of books), or they may be placed at the close of each book. The latter method is preferred with most pupils, as they should be quite familiar with the propositions of any given book before they are prepared to apply these principles to the investigation of other truths. One original theorem each day to apply the principles gone over, in connection with two or three theorems of the following book, will make a very interesting exercise. At the close of the text-book, there should be a large number of miscellaneous theorems for original thought.

This is the method used in arithmetic and algebra, and it seems surprising that it has not been more generally employed in geometry. Several authors seem recently to have realized the importance of such exercises, and have occasion ally given some practical problems, and, in one or two instances, a collection of undemonstrated theorems. In the author's work on geometry, such problems and theorems are a prominent and essential part of the plan.

II. THE RECITATION.—The several things to consider under the recitation in geometry are: 1. The assignment of the theorems; 2. The construction of the diagrams; 3. The demonstration; 4. The criticism; 5. New matter.

Assignment.—The theorems may be assigned to the pupils in various ways. They may be given out at random, without any reference to the ability of the class; or, if there are some in the class who are not very strong in the branch, the easier propositions may be given to them. The best way probably is to assign by chance, which may be done by writing the numbers of the propositions on small pieces of paper, and requiring the pupils to draw these papers. It is suggested that at least one day's review lesson should be included in each recitation, the class taking three or four propositions in advance, and the same number in review.

Construction.—The pupil having received a theorem, should be required to go to the board and construct the diagram without any reference to the book. The lines should be drawn by free hand, and not with the aid of a ruler. The letters of the diagram should be placed at random, and different from the order in the book, in order to prevent a recitation from memory. Figures in place of letters may often be used in marking the diagrams. It will add interest also for one pupil to construct the diagram for another pupil, each thus constructing the figures of one proposition, and demonstrating another.

Demonstration.—In demonstrating the theorems, the pupil should stand at the board in an erect and easy attitude, his face turned partly toward the class, and the pointer being in the hand next to the board. The theorem should first be stated clearly and precisely, and in the language of the book, unless it can be equaled or improved. The demonstration should be clearly and logically presented, the definitions and axioms referred to by number or, with beginners, by repetition, and previous theorems referred to by number of book and theorem. When the demonstration involves several proportions, these may be written out on the board and be pointed at in the demonstration.

It will be well also for the pupil to write out an analysis of the course of reasoning involved in a demonstration. Sometimes an analysis merely of the references or dependent truths may be written. Sometimes the pupil may be required to write an analysis of all the principles involved in the demonstration, tracing each truth all the way back to the definitions and axioms. Such an exercise will be found most valuable in giving pupils a thorough knowledge of the subject.

Criticism.—At the close of the recitation of any pupil, the members of the class who have observed any errors may be called upon to point them out. These may consist of the omission of necessary links in the chain of reasoning, the omission or misquoting of references, etc., etc. Pupils who have a shorter or better, or even a different method, may be called upon to give it. Errors unnoticed by the pupils, may then be pointed out by the teacher.

Questioning.—The teacher should quiz the pupil on his demonstration. He should ask questions like the following: What kind of demonstration is it? Why do you begin as you do? Why do you prove such a thing equal to such a thing? What relation does this proposition bear to the preceding proposition? What application can you make of this truth? Show its application, etc.

Outlines.—At the close of a book, the pupil should be required to give an outline of the book; show the design of it; show what propositions reach final truths, and what propositions were merely auxiliary: show the relation of each proposition to the chain of logic, and how the chain would be broken by the omission of any proposition; etc. By following these suggestions, the teacher will make geometry a delightful study to his pupils, and a most valuable means of mental culture.

New Matter.—If the teacher has any new matter, it may be presented at this time. He may give a discussion of the general nature of the lesson, show the excellence or defect of the method of development made use of, and make a comparison between the method of treatment used by the author and that of other authors. He should then assign the next lesson, and present any suggestions concerning it that may seem advisable.

Conclusion.—In conclusion, we would urge teachers to introduce the elements of geometry into our public schools. A little less arithmetic, if need be, in order to present some geometry, would be an advantage. We trust that teachers may realize the importance of the subject, and endeavor to awaken a deeper interest in the beautiful science of form—a science over which the ancient sages mused with such deep enthusiasm, and to which the achievements of modern art and invention are so largely indebted.

CHAPTER VII.

TEACHING ALGEBRA.

ALGEBRA is that branch of mathematics which investigates quantity by means of general characters called symbols. The term originated with the Arabs, and comes from *al-gabr*, a reduction of parts to a whole. The definition given states the general character of the subject, though it is difficult to give a definition that fixes precisely its province and object.

Relation to Arithmetic.—Algebra in its elements is closely related to arithmetic. It had its origin in arithmetic, and its fundamental ideas and operations are arithmetical. Its symbols of quantity were at first merely general symbols of numbers, and its fundamental operations of addition, subtraction, etc., were entirely similar to those of arithmetic. On account of this relation, algebra has been called a kind of *general arithmetic*. Newton called it *Universal Arithmetic*. D'Alembert regards it as a special branch of the general science of numbers; and divides arithmetic into *Numérique*, special arithmetic, and *Algébre*, general arithmetic.

Wider View.—This view of the nature of algebra is now too narrow. Algebra has transcended the bounds of its origin. It reaches from arithmetic over into geometry, including continuous as well as discrete quantity. From the generality of its symbols, also, many ideas and processes arise which have no meaning or use in arithmetic; as negative and imaginary quantities, the solution of higher equations, etc.

Another important difference is, that in arithmetic the com putations being made as they arise, all traces of the intermediate steps are lost, and the result is applicable to a single case only; whereas in algebra the result is general, and contains implicitly the answer to all problems of the same general class. The combination of algebraic symbols leads to expressions called *formulas*, in which the operations are indicated rather than performed, and which admit of interpretation. These formulas often express a general truth corresponding to a theorem, which arithmetic can verify in particular cases; as $(a+b)(a-b)=a^2-b^2$, and $x=-p\pm\sqrt{q+p^2}$.

Comte's View.—Comte divides mathematics into *geometry* and *analysis* or *calculus*. Calculus embraces *algebraic calculus*, or *algebra*, and *arithmetical calculus*, or *arithmetic*. Algebra is defined "as having for its object the *resolution of equations*," which signifies "the transformation of *implicit* functions into equivalent *explicit* ones." Arithmetic is defined as the science which "ascertains the *values of functions.*" "ALGEBRA *is the calculus of functions;*" and "ARITHMETIC *is the calculus of values.*" Sir William Rowan Hamilton, the author of *Quaternions*, defines algebra as the science of time, which De Morgan changes to the calculus of succession.

Symbols.—The symbols of algebra are of three general classes; Symbols of Quantity, Symbols of Relation, and Symbols of Operation. The Symbols of Quantity are of two kinds; symbols of *known* quantities and symbols of *unknown* quantities. They include also the two limits of quantity, zero, 0, and infinity, ∞. The Symbols of Operation include the signs of all the operations to which quantity can be subjected. The Symbols of Relation include the symbols which arise in comparing quantity; as, $=$, $:$, $::$, $>$ $<$, etc.

The symbols of quantity apply to continuous as well as discrete quantity. Thus a and b may represent two *lines* as well as two *numbers*. If these lines have a common unit, then a and b may be regarded as representing the lines *numerically;* but when the lines have no common unit, a and b denote them as continuous, and not as discrete quantity.

Generalization.—The spirit of generalization in algebra is the source of many of its ideas and processes. From this we have the *negative quantity*, the *fractional* and *negative exponent*, the *imaginary quantity*, etc., each of which admits of explanation and leads to new conceptions in the science Thus, the sign of subtraction is primarily used to denote that a quantity is to be subtracted ; but if we subtract a from the quantity $a-b$, we have a remainder of $-b$, the interpretation of which gives us the idea of a *Negative Quantity.*

The *Fractional Exponent* originates in the same way. Having agreed to indicate a power by an exponent, by generalization we have a^n; and since n can represent any quantity, it may represent a fraction, as $\frac{3}{4}$, and we have $a^{\frac{3}{4}}$. This expression being interpreted, we find means the *third power* of the *fourth root* of a. Or, having the rule that the root of a quantity may be obtained by dividing its exponent, in extracting the 4th root of a^3 we reach the same result, $a^{\frac{3}{4}}$.

The *Negative Exponent* has a similar origin. Since the general exponent may represent any quantity, it may represent a negative quantity, and we may thus have a^{-n}; a new idea which needs interpretation. Or, if we divide a^n by a^{2n} according to the general rules of division, we also reach the expression a^{-n}; and this we find denotes the reciprocal of a^n, or that $a^{-n}=\frac{1}{a^n}$

The *Imaginary Quantity* arises by a similar process of generalization. In the general expression $\sqrt[n]{a}$, n may be *even* and a may be *negative*, which gives us such expressions as $\sqrt{-4}$, $\sqrt[3]{-8}$, $\sqrt[4]{-16}$, etc. Or, given general methods of solving quadratic equations, imaginary expressions may arise from the solution of such equations, as $x^2=-4$, or $x^2-2x=-5$. This expression must also be interpreted. In the same way, other ideas arise in algebra from the generality of the notation and of the methods used

Division of Subject.—The science of algebra admits of the same fundamental divisions as arithmetic. These processes are all included under the three heads; Synthesis, Analysis, and Comparison. The fundamental operations are Addition, Subtraction, Multiplication, and Division. The derivative or secondary processes are Composition, Factoring, Common Multiple, Common Divisor, Involution, and Evolution. Comparison gives rise to the Equation, Ratio, Proportion, the Progressions, etc.

Each of these processes, on account of the generality of the symbols and operations, gives rise to processes and expressions not found in arithmetic. In respect to the new process called Composition, we remark that its scientific necessity is seen from the fact that each analytic process has its corresponding synthetic process. Thus addition is synthetic, subtraction is analytic, multiplication is synthetic, division is analytic, etc.; it follows, therefore, that there should be a synthetic process corresponding to the analytic process of Factoring. This process we have called Composition; and its value is especially apparent in algebra, on account of the several interesting and practical cases which it embraces.

The Equation.—The fundamental process of comparison in algebra is that of the Equation. The equation makes its appearance in arithmetic, but is not of sufficient distinctive importance to be regarded as a distinct part of the science. In algebra, however, it is of fundamental importance; and gives the science its principal value. Indeed, so largely does it enter into the subject, that it would not be very far from the truth to say that algebra is the science of the equation.

The principal use of the equation is to compare unknown quantities, variously involved, with known quantities, the object being to find the value of these unknown quantities. In the effort to disengage the unknown quantity from the known and find an expression for its value in known terms, we discover methods of procedure called the *solution* or *resolution* of the equation. The solution of the equation gives rise to several processes, among which are Transposition, Substitution, Completing the Square, etc.

The solution of the general equation has never been determined, and is no doubt impossible. The solution of the cubic and bi-quadratic is attended with difficulties that render the present methods not entirely satisfactory; and the solution of the general equation beyond the fourth degree has never been accomplished and is believed to be impossible. But though no solution of the general equation has been found, many properties have been discovered that enable us to know much about their roots. These properties embrace some of the most beautiful things in the science of mathematics, such as Descartes' Rule, Sturm's Theorem, etc., and confer immortality upon their discoverers. Besides these, we have in Horner's Method a general method of solving all numerical equations that have real roots.

Reasoning.—The reasoning of algebra is essentially deductive. The comparison of quantities is usually that of equals, the relation being expressed by the equation. This equation is operated upon in various ways, all the operations being controlled by the axioms of the science. All the operations of addition, subtraction, transposition, substitution, etc., are governed by axiomatic principles, and this makes the reasoning deductive.

Induction.—Though algebra is a deductive science, it is possible to derive some of its truths by induction. Indeed, many of the first generalizations of its symbols are inductive in their character. Several of its leading truths were discovered by an inference from particular cases, and were afterward demonstrated. Newton's Binomial Theorem was derived in this way; and it is presented in this manner to the students of elementary algebra. The divisibility of $a^n - b^n$ by $a-b$ may be inferred from the truth of the several cases a^2-b^2, a^3-b^3, a^4-b^4, etc.

Mathematical Induction.—There is a method of reasoning in algebra called *mathematical induction*, which differs from pure induction. Mathematical induction derives a general truth by showing that what is true in n cases is true in $n+1$ cases; while pure induction proceeds upon the principle that what is true in many cases is true in all. The principle of mathematical induction is used by many writers in proving that $a^n - b^n$ is divisible by $a-b$, and also in giving a general demonstration to the Binomial Theorem.

History of Algebra.—The first known treatise on algebra is found in the Arithmetic of Diophantus, written in the fourth century. Though not presenting a complete treatise on algebra, it lays an excellent foundation for the science. It contains the first enunciation of the rule that "minus multiplied by minus produces plus;" solves such problems as "Find two numbers such that the sum or difference of their squares are squares;" and then proceeds to the solution of a peculiar class of problems which belong to what is now called indeterminate analysis.

It is supposed that some of the principles were known before the time of Diophantus; but he greatly enriched the science with new applications. He shows great skill in the subject, presenting some elegant solutions, and is regarded as the author of Diophantine Analysis. The celebrated Hypatia composed a commentary on Diophantus, which is now lost. The work of Diophantus was discovered at Rome, in the Vatican library, about the middle of the sixteenth century, having probably been brought there from Greece when the Turks captured Constantinople.

Algebra was introduced into Europe by the Arabs, who had carefully collected the writings of the Eastern mathematicians and written commentaries upon them. A copy of an Arabic original is preserved in the Bodleian Library at Oxford, bearing a date of transcript corresponding to the year 1342. This work is supposed to have been derived from the Hindoos. Very few additions to the science seem to have been made by the Arabs, though they cultivated it with great enthusiasm. The science of algebra was introduced into Italy by Leonardo, a merchant of Pisa, who had travelled extensively in the East, in a work composed two centuries before the invention of printing. He could solve equations of the first and second degrees, and was particularly skillful in the diophantine analysis. Like the Arabian writers, his reasoning was expressed in words at length, the use of symbols being a much later invention.

The earliest printed book on algebra was composed by Lucas di Borgo, a Minorite friar. It was called *Summa de Arithmetica, Geometria, Proportioni, et Proportionalita*, and was published in 1494 and again in 1523. It followed Leonardo very closely; but the mode of expression was very imperfect, the symbols employed being a few abbreviations of the words or names which occurred in the process of calculation,—a kind of short-hand arithmetic. The application was also limited, being confined to the solution of certain problems about numbers. It included the solution of equations of the first and second degrees, the latter being divided into cases, each of which was solved by its own particular rule, many of which were derived from geometrical constructions, and expressed in Latin verses to be committed to memory.

Up to the fifteenth century, the science was limited to the solution of equations of the first and second degrees. In 1505 Scipio Ferreus, a professor of mathematics in Bononia, discovered the solution of a particular case of an equation of the third degree. Ferreus communicated his discovery to a favorite scholar, Florido, who challenged Tartaglia, a noted mathematician, to a trial of skill in solving questions. Tartaglia had, however, discovered the solution of four cases of cubics, and came off victorious. Cardan, Professor of Mathematics at Milan, made great efforts to obtain the rules of Tartaglia, who finally consented to show his method, which Cardan, in violation of an oath of secrecy exacted by Tartaglia, published with some improvements, in a work he was then preparing. Lewis Ferrari, a pupil of Cardan, soon afterwards discovered the solution of an equation of the fourth degree. In 1572, Bombelli, an Italian mathematician, published a work in which he explained the nature of the *irreducible case* of cubic equations, which had perplexed Cardan.

In 1540 Recorde published his famous *Whetstone of Witte*, in which the sign of equality first appeared. Vieta (1540-1603) was the first to employ general characters to represent known quantities, which was a great step in advance. He also improved the theory of equations and gave the first method of solving them by approximation. Albert Girard (1629), a Flemish mathematician, was the first to speak of *Imaginary Quantities;* and inferred also by induction that any equation has as many roots as there are units in the number of its degree. Thomas Harriot made the important discovery that every equation may be regarded as formed by the product of as many simple equations as there are units in the number expressing its order. He also made several changes in the notation, and added several signs, so that as it came from his hands it differed very little from its form at the present time. Descartes (1637) made one of the greatest improvements by the application of algebra to curved lines, which resulted in a new branch, *Analytical Geometry.*

The science was subsequently enriched by Newton, who discovered the binomial theorem, and by Euler, who made extensive applications of it. Lagrange was the first to prove that every numerical equation has a root, which had previously been only assumed. Gauss, 1801, developed the subject of *binomial equations;* W. G. Horner, in 1819, published his celebrated method of solving numerical equations ; and in 1829 Sturm made known his beautiful theorem for assigning the position of the real roots of an equation.

The latest improvement is the development of the subject of *Determinants.* The germ of this theory is found in the writings of Leibnitz. It was revived more than fifty years afterwards by Cramer, and was extended by Gauss and others.

It has received its latest and fullest development at the hands of two great English mathematicians, Cayley and Sylvester.

Method of Teaching Algebra.

We shall now give a brief discussion of the method of teaching algebra. We shall present several principles to guide the teacher in the instruction, then show how to teach some of the elementary portions of the subject, and then close the article with a few general suggestions to the teacher.

Principles of Instruction.—There are several general principles which should guide the teacher in presenting the subject of algebra to the beginner.

1. *We should lead the pupil to make the transition from arithmetic to algebra;* algebra grew out of arithmetic. This is in accordance with the genesis of the science. It is also indicated by the law of thought *from the particular to the general*, algebra being a kind of general arithmetic. We should introduce algebraic methods while teaching arithmetic. Mental arithmetic, especially, may be made to flow naturally into mental algebra. Algebraic methods may also be introduced into written arithmetic, as in percentage, $p=br$; also in interest, as $i=ptr$; and also in the progressions, etc. In advanced arithmetic, many of the subjects should be generalized and presented in algebraic notation.

2. *We should begin algebra with concrete problems, and not with the abstract operations of the science.* This is also in accordance with the laws of thought. It is also the historic order; algebra was an outgrowth of the attempt to solve concrete problems. It makes the subject much easier for pupils, as they catch the spirit of the algebraic method, and are thus better prepared to understand the abstract operations of the science. The more recent writers on elementary algebra make a great mistake in omitting such exercises as an introduction to the subject.

3. *The pupil should have a thorough drill in the practice*

of algebra. Algebra is a calculus, and the pupil needs to become skillful in algebraic manipulations. It is discouraging to have pupils in analytical geometry and calculus, who are constantly making mistakes in the algebraic operations. There should be a large collection of examples in the fundamental rules, fractions, equations, radicals, etc., to afford the means of acquiring this skill. The teacher of elementary algebra should select and prepare two or three times the number of examples found in any ordinary text-book on algebra, and drill his pupils on them.

COURSE OF INSTRUCTION.—The course of instruction in elementary algebra should include the following things: 1. An Introduction, including the solution of concrete problems and the introduction of the algebraic symbols; 2. Algebraic Notation; 3. Explanation of the Negative Quantity; 4. Fundamental Operations; 5. Secondary Operations; 6. Fractions; 7. Simple Equations; 8. Solution of Problems, etc.

1. ***Introduction.***—To introduce the subject of algebra, take a simple problem in mental arithmetic, and write out the analysis upon the board, and then transform this analysis into the abbreviated method of algebra. To illustrate, take the problem, "William has 3 times as many apples as Henry, and both have 24; how many has each?"

Illustration.—By arithmetic we solve the problem as follows:

Henry's number, plus three times *Henry's number,* equals 24;
Hence 4 times *Henry's number* equals 24;
And once *Henry's number* equals $\frac{1}{4}$ of 24, or 6, etc.

Now, if we represent the expression, "Henry's number," by some character, as the letter x, the solution will be made shorter, as seen in the margin. If we now use $3x$ to represent "3 times x," and $4x$ to represent "4 times x," the symbol $=$ for the word "equals," and the symbol $+$ for the word "plus," the solution will be still shorter, as seen in the margin. This solution is purely algebraic, and is a type of the entire method of algebraic reasoning.

x plus 3 times x equals 24,
hence 4 times x equals 24;
and once x equals 6.

$$x+3x=24;$$
$$4x=24;$$
$$x=6.$$

The pupil will see that the last solution is the same as the first, except that we use *characters* instead of *words*. These characters are called *symbols*. The pupil may then be shown that $2x$, $3x$, etc., means "2 times x," "3 times x," etc.; that "one-half of x," "2 thirds of x," are expressed thus: $\frac{1}{2}x$, $\frac{2}{3}x$, or $\frac{x}{2}$, $\frac{2x}{3}$, etc. He may also be told that an expression like $x+3x=24$, is called an *equation*. The pupil should then be drilled on the solution of concrete problems until he is familiar with the algebraic idea, and the fundamental principles of notation. Problems may be selected in which all the simple elements of notation may be gradually introduced. Symbols for known quantities may also be used. For classes of problems, see author's *Elementary Algebra*.

2. ***Algebraic Notation.***—The pupil is now ready for a formal explanation of algebraic notation. The various symbols should be presented, and the pupil quite thoroughly drilled in *reading* and *writing algebraic expressions*. It will be well also to drill the pupil in *finding the numerical value of algebraic expressions* by substituting numbers for letters.

3. ***Negative Quantity.***—The next step is to explain the meaning and use of the *negative quantity*, as this will be needed in understanding the fundamental operations. We first show that a *positive quantity* means an *additive quantity*, and denotes that something is to be *increased* by it; and that a *negative quantity* is a *subtractive quantity*, and denotes that something is to be *diminished* by it. We next lead the pupil to see that, since *positive* and *negative* are *opposite in meaning*, they may be used to represent *quantity considered in opposite directions* or *senses*. Thus, if we use $+$ to represent a person's *gains* in business, we may use $-$ to represent his *losses*: *north latitude* may be denoted by $+$ and *south latitude* by $-$; *future time* by $+$ and *past time* by $-$, etc. It will thus be seen that the symbols $+$ and $-$ may indicate the *nature* of quantity, as well as the *operations* to be performed on it.

Principles.—We next establish some principles pertaining to the negative quantity. Thus, since \$8 united with \$5 *gain* and \$5 *loss* leaves \$8, we infer that uniting $+5$ and -5 makes *nothing*, or that *uniting a positive and negative quantity of the same absolute value amounts to nothing.* We next show that in algebra *a positive quantity is regarded as greater than a negative quantity, whatever their absolute value.* Thus, if we unite 8 with $+4$, and also with -6, the first result is 12, and the second 2, from which we infer that $+4$ is greater than -6. Such a drill on the nature of positive and negative quantities is absolutely necessary in order to understand their use in algebraic addition and subtraction.

4. ***Addition.***—Addition is most conveniently treated under two cases: 1. To add similar quantities; 2. To add dissimilar quantities. The first case embraces two sub-cases: 1. When the signs are alike; 2. When the signs are unlike. When the terms have the same sign, the process is entirely simple; when they have unlike signs, the process needs explanation.

Methods.—There are two methods of explaining this case, which we distinguish as the Old Method and the New Method. The New Method introduces the idea of an *auxiliary quantity;* that is, it assumes that a *positive term* denotes that *some quantity is increased* by the term, and a *negative term* denotes that *some quantity is diminished* by the term.

Illustration.—PROB. What is the sum of $7a$ and $4a$, or $-7a$ and $-4a$? SOL. The sum of $7a$ and $4a$ is evidently $11a$; and the sum of $-7a$ and $-4a$ is evidently $-11a$. PROB. What is the sum of $7a$ and $-4a$? SOL. Plus $7a$ denotes *some quantity increased* by $7a$, and $-4a$ denotes *some quantity diminished* by $4a$; and *any quantity increased* by $7a$ and *diminished* by $4a$, is evidently *increased* by $3a$; hence the sum of $7a$ and $-4a$ is $+3a$. PROB. What is the sum of $-7a$ and $+4a$? SOL. A quantity *diminished* by $7a$ and *increased* by $4a$ is evidently *diminished* by $3a$; hence the sum of $-7a$ and $+4a$ is $-3a$. We may also explain the sum of $7a$ and $-4a$ as follows: $7a=3a+4a$; and $-4a$ united with $+4a$ is zero. Hence $-4a$ united with $3a+4a$ equals $+3a$.

5. ***Subtraction.***—Subtraction is conveniently presented

under two general cases: 1. When the terms are similar; 2. When the terms are dissimilar. The former includes two sub-cases: 1. When the terms have like signs; 2. When the terms have unlike signs. The second principal case includes two sub-cases: 1. *Monomials*; 2. *Polynomials*.

Methods.—There are several methods of explaining subtraction, among which we may mention the following: 1. A new method; 2. Leibnitz's method; 3. Adding to both terms; 4. Negative quantity less than zero; 6. Latitude and longitude method. The new method makes use of the *auxiliary quantity*, regarding $+2a$ as denoting *some quantity increased* by $2a$, and $-3a$ as denoting *some quantity diminished* by $3a$; the "*some quantity*" being used as auxiliary in the process.

Illustration. New Method.—PROB. Subtract $7a$ from $4a$. SOL. A quantity increased by $4a$ is evidently $3a$ *less* than the quantity increased by $7a$; hence $4a$ minus $7a$ equals $-3a$. In a similar manner we may explain the following problems: (2). $-7a$ minus $-4a$; (3). $-4a$ minus $-7a$; (4). $-7a$ minus $4a$; (5) $7a$ minus $-4a$; (6). $4a$ minus $-7a$; (7). $-4a$ minus $7a$. PROB Subtract $-c$ from a. SOL. The difference between a quantity increased by a and diminished by c is evidently the sum of a and c, or $a+c$; hence $-c$ subtracted from a equals $a+c$

The *Method of Leibnitz* would solve the last problem thus: $a=a+c-c$, and $-c$ subtracted from $a+c-c$ equals $a+c$. This cannot be applied conveniently to the problems given above. The method of *adding to both terms* is as follows: adding c to a, we have $a+c$; adding c to $-c$ we have $c-c=0$; and 0 subtracted from $a+c$ leaves $a+c$; hence, *since the difference between two quantities equals the difference between the two quantities equally increased*, $-c$ subtracted from a leaves $a+c$. By the method of *Latitude and Longitude*, we consider $7a$ as representing so many degrees *north* of the equator, and $-4a$ as representing so many degrees *south* of the equator; and the difference between $7a$ north and $4a$ south is evidently $7a+4a$ or $11a$. It is not so convenient in this method, however, to fix the sign of the difference. The general case may be explained by subtracting $b-c$ from a.

6. ***Multiplication.***—Multiplication is conveniently treated under two cases: 1. To multiply by a monomial; 2. To multi-

ply by a polynomial. In presenting multiplication, there are four things which require attention: 1. The Co-efficients; 2. The Literal Part; 3. The Exponents; 4. The Signs. To explain the multiplication of the co-efficient and the literal part, let the pupil see clearly the principle, *Multiplying any factor of a quantity multiplies the quantity.* To explain the exponents, show that, *The exponent of a term in the product equals the sum of its exponents in the factors.*

Methods.—There are two methods of explaining the signs, called the *Monomial Method* and the *Binomial Method.* The Binomial Method explains by multiplying $a-b$ by $c-d$; and has usually been employed by mathematicians. The Monomial Method is preferable, however, as it looks the difficulty squarely in the face, and shows just why the signs should be as they are.

Illustration.—To determine the law of the signs, we will multiply b by a; $-b$ by a; b by $-a$; and $-b$ by $-a$.

OPERATION.

$$\begin{array}{cccc} +b & -b & +b & -b \\ \underline{+a} & \underline{+a} & \underline{-a} & \underline{-a} \\ +ab & -ab & -ab & -(-ab) \\ & & & =+ab. \end{array}$$

First, $+b$ taken any number of times, as a times, is evidently $+ab$.

Second, $-b$ taken once is $-b$; taken twice, is $-2b$, etc.; hence, $-b$, taken any number of times, as a times, is $-ab$.

Third, b multiplied by $-a$, means that b is to be taken *subtractively* a times; b taken a times is ab, and taken *subtractively* is $-ab$.

Fourth, $-b$ multiplied by $-a$, means that $-b$ is to be taken *subtractively* a times; $-b$ taken a times is $-ab$, and used *subtractively* is $-(-ab)$, which, by the principles of subtraction, is $+ab$.

Hence, we infer that *the product of quantities having* LIKE *signs is* PLUS, *and having* UNLIKE *signs is* MINUS.

7. ***Division.***—Division is conveniently treated under two cases: 1. To divide by a monomial; 2. To divide by a polynomial. There are four things to be considered, as in multiplication: 1. The Co-efficients; 2. The Literal Part; 3. The Exponents; 4. The Signs. The explanation of the division of the co-efficients and letters depends on the principle, *Taking a factor out of a quantity divides the quantity by that factor.* The explanation of the exponents depends on the

principle, *The exponent of a term in the quotient equals its exponent in the dividend minus its exponent in the divisor.* The law of the signs is derived from the law of the signs in multiplication.

8. ***Composition and Factoring.***—For the treatment of Composition and Factoring, see the author's *Elementary Algebra.* Attention is called especially to the demonstration of the theorem concerning the divisibility of $a^n - b^n$ by $a - b$, and theorems similar to it. The usual method is that of *mathematical induction;* the method we have given is much simpler. It is suggested that the student be thoroughly drilled in Factoring, as it lies at the basis of algebraic analysis. The student-teacher may be required to give an outline of the several cases, and show how to teach them.

9. ***Fractions.***—Fractions, in algebra, are to be regarded as the expression of one quantity divided by another. The principles are established by demonstration, and then are to be applied in deriving the rules of operation. Let the student-teacher give an outline of the cases, and explain the method of their treatment. Show also what difficulties pupils usually meet with, and how to explain them.

10. ***Equations.***—The elements of equations are simple and readily taught. Some teachers illustrate transposition by a *pair of scales* or *balances*, showing that if anything is put into or taken from one scale an equal quantity must be put into or taken from the other scale. Such an illustration is not needed, however, as a pupil readily grasps the axiom that *if equals be added to or taken from equals, the results will be equal.* The pupils should be thoroughly drilled on the solution of equations until they are familiar with the *general methods* and all the *special artifices* that apply to particular cases.

11. ***Solution of Problems.***—Pupils should have an extensive drill on the solution of concrete problems. The solution of such problems consists of two parts; the forming of the

equation, and the solution of the equation. The first is called the concrete part, the latter the abstract part of the solution. The pupil should have wide and extensive experience in both of these, for it is only in this way that he can become a skillful algebraist. He may also be encouraged to make new problems for himself and schoolmates to solve.

General Suggestions.—We close the subject with some general suggestions to the teacher.

Literal Notation.—The teacher should be careful to see that the pupils have a clear idea of the literal notation. First, they should see clearly that a *letter* represents a *general number*, and that this number may be integral or fractional. Second, that as involved in an expression, each letter is a *factor*. There should be a drill with figures, as $3 \times 4 \times 5$, and then changing to $a \times b \times c$, and then to abc, until this idea is clearly developed.

Positive and Negative.—The pupil should be led to a clear idea of the *positive* and *negative* quantities. He should first be taught that $+$ and $-$ denote *operations*. He should next see that they give *character* to quantities, and indicate *positive* and *negative* quantities. He should then be led to understand that they may be used to represent quantities reckoned in *opposite directions*.

Exponents.—The pupil should first learn to use and understand exponents as indicating the powers of quantities. After he has reached the idea of generalization in algebra, he should see that in a^n, the n being general may be integral or fractional, and that when fractional the numerator denotes a power, and the denominator a root. Again, since n is general it may be *negative*, and as such needs an interpretation, the origin and meaning of which should be clearly shown. And, again, n being general, a^n may be a^0 or a^∞, each of which should be clearly interpreted. The use of fractional exponents in *radicals* should be thoroughly understood, and the pupil should be taught to *work radicals largely through fractional* *exponents.* This will simplify many points that are, at first, quite difficult for the learner.

Generalization.—The pupil should be thoroughly drilled in the generalizations of the science. The spirit of generalization lies at the basis of algebra, and no one can understand it until he is thoroughly imbued with this spirit. Pupils should be required to generalize special problems and derive general rule. They should discuss these general expressions, show the cases that may arise for different suppositions, and apply these expressions in the solution of problems of a given class.

Interpretation.—The pupil should be trained to interpret algebraic results. The solution of the *general simple equation*, $ax-bx=c$, the *problem of the couriers*, etc., should be discussed, and the different results which arise be interpreted The discussion of the *roots* of the *general quadratic equation*, $x^2+2px=q$, showing the relations of p and q to the roots, is a most valuable exercise, and tends to imbue the mind of the pupil with the true algebraic spirit. No one is an algebraist who cannot interpret results; and a knowledge of its application to the physical sciences is impossible without the ability to discuss and interpret general formulas.

PHYSICAL SCIENCE.

CHAPTER I.

NATURE OF PHYSICAL SCIENCE.

THE Physical Sciences are the sciences which treat of the material world. They consist of facts and phenomena, and the truths and principles which relate to them. They begin in the observation of facts, these facts are classified, and the causes which produce them and laws which control them are ascertained.

The object of these sciences is the interpretation of the physical universe. They assume that man is the interpreter of nature, and that science is its right interpretation. They are based on the uniformity of nature, and thus give foresight to man and enable him to predict what will take place in the future. The scientist thus makes *prevision*, or the prophetic nature of knowledge, the basis and test of science. Reasoning from the standpoint of the physical sciences, Herbert Spencer defines all science as merely the power of prevision.

I. Classification.—No complete classification of the physical sciences has yet been given which is satisfactory. They so overlap and interlace that it is difficult to draw a clearly marked line of distinction between them. The principal branches are Natural History, Natural Philosophy, Astronomy, Chemistry, Geography, Geology, Biology, etc. These branches are distinguished partly by their subject matter and partly by their objects and methods of development.

Natural History.—Natural History treats of the three kingdoms of nature,—the mineral, the vegetable, and the animal kingdoms. Its object is to ascertain the facts relating to the nature, structure, and growth of the individual objects, and to arrange these objects in scientific classes. It assumes that they were created after great pattern ideas, and that the object is to discover these ideas in their development, and to classify accordingly. They have been appropriately called the Classificatory Sciences. The grand object of Natural History, therefore, is *classification*.

The branches of Natural History are Zoölogy, Botany, and Mineralogy. In Zoölogy it is assumed that the animal kingdom was created after four great leading ideas or types of structure, called Vertebrates, Articulates, Radiates, and Mollusks; and that these ideas are differentiated all the way down to species and individuals. In Botany two great leading types are found, the Phænogamia and Cryptogamia, each of which constantly divides into subdivisions, ending at last in species and individuals. Mineralogy is also regarded as the development of ideas which form distinctly marked classes.

Natural Philosophy.—Natural Philosophy treats of the facts and phenomena of the material world. Its object is to ascertain these facts and phenomena, and to discover the causes which produce them and the laws which govern them. Thus, in respect to *falling bodies*, it ascertains the cause to be *gravity*, and the law that *the distances are proportioned to the squares of the times*. It seeks to acquire the facts respecting *Light*, to explain these facts by the cause of *undulatory motions*, and to discover the laws of reflection, refraction, etc. It differs from Natural History in that its facts do not admit of classification into genera and species; and also in that it deals more particularly with laws and causes.

The principal branches of Natural Philosophy are Mechanics, Hydrostatics, Pneumatics, Optics, Acoustics, Thermotics, etc. Mechanics treats of the general laws of force; Hydrostatics treats of liquids; Pneumatics treats of the air; Optics treats of light; Acoustics treats of sound; Thermotics treats of heat; etc. These divisions seem quite distinctly marked, and yet there are indications of future changes; and even the term Natural Philosophy may not be always used to include the several branches above named.

Astronomy.—Astronomy treats of the facts and truths relating to the heavenly bodies. It is closely related to Natural Philosophy, differing mainly in the subject matter of its investigations. It explains the appearances, changes, motions, etc., of the heavenly bodies, calculates their size and distance, investigates their composition, structure, etc. It is appropriately named the "sublime science," and gives us the grandest ideas of the nature and magnitude of the physical universe.

Chemistry.—Chemistry treats of the nature and properties of the elements of bodies. It differs from Natural Philosophy in that the former considers the general laws of matter in the forms in which it presents itself, while Chemistry considers the elements out of which matter is composed, and explains the changes that occur in bodies through the operation of these elements. Its object is to ascertain the composition of material things, and to explain the method of their formation. It regards matter as composed of infinitely small elements called atoms; and thus occupies about the same place among the physical sciences that the infinitesimal calculus does in the mathematical sciences.

Biology.—Biology is the science which treats of life, or living matter. It seeks to ascertain the facts and understand the laws of the life principle found in matter, and endeavors to explain the complicated phenomena of living beings. It rises above the other natural sciences in that it treats not only of matter, but of organized matter; it considers not merely force, but that life force which holds matter in its hand, and shapes it into the organic beings of the vegetable and animal world. It is a science of recent development; and though difficult, and still in an incomplete condition, is one of great interest, and promises to be of great practical value. There are several other branches of the Physical Sciences, as Geology, Geography, etc.

II. Elements of Physical Science.—The several elements of the Physical Sciences are Facts and Phenomena, Systems of Classification, Causes of Facts and Phenomena, Laws governing Facts and Phenomena, and Truths growing out of them. The object of the inquirer in these sciences is to attain these elements.

Facts and Phenomena.—The primary elements of the Physical Sciences are Facts and Phenomena. A Fact is something that is or has been. It is a particular truth in the domain of sense. It is something seen or heard, or that was revealed through one of the senses. It is confined to the present or the past, and does not reach out to the future, as that is the sphere of a truth. Thus it is a fact that "the sun rose this morning," that "there was snow last winter," that water freezes at 32° above zero," etc. A Phenomenon is literally an appearance; as the twinkling of a star, the changing of the moon, the rising of the tide, etc. The statement of a phenomenon in a proposition gives us a fact.

Classifications.—Several of the Physical Sciences aim especially at the classification of facts. In Natural History the principal elements are facts and their classification. In these sciences it is assumed that the world was constructed after great pattern ideas or plans of structure; and objects are classed by means of these ideas. Zoölogy embraces all the animals under five great divisions; Branches, Classes, Orders, Families, Genera, and Species. The Branches represent the plan of structure; the Classes, the manner of execution; the Orders, the comparative complication of execution; the Families, differences of form; Genera, details of structure; Species, difference in size, habits, etc. The great divisions in

Botany are Species, Genera, Orders, Cohorts, Classes, and Sub-kingdoms; divisions founded in nature, and thus called the Natural System.

Causes.—The grand aim of the Physical Sciences is to ascertain the Causes of things. By a Cause is meant that which produces an event, or but for which some event would not occur. The great question of Physics is *why;* and the answer to this question gives us a large body of scientific truths. Thus, *gravity* explains why a stone falls, and also the planetary motions; the earth revolving on its axis explains the phenomena of day and night; elliptical orbits with the sun in a focus explain the changes of the heavenly bodies; the undulations of an ethereal fluid explain the interesting phenomena of light, etc. These causes are reached through hypothesis and theory.

Laws.—The second great aim of the Physical Sciences is to ascertain the Laws of physical phenomena. By Laws we mean the regular mode or order according to which something operates or events take place. This element is closely related to the inquiry for the Cause, but yet is different from it. Thus, *gravity* is the cause of a body falling, but it is a law that *the force of gravity varies inversely as the square of the distance*, or that *the distances passed over by a falling body are in proportion to the squares of the times.* The cause of the changes of the planetary bodies is an *elliptical orbit;* and a law of motion in such an orbit is that *the radius vector passes over equal areas in equal times.*

Truths.—A Truth of physical science is a statement of some established principle, or some inference derived from it. Truths embrace both laws and causes, the statement of a law or a cause being a truth. The statement of any general proposition which has been verified, or any inference derived from it, is also a truth. Thus, *heat expands all metals*, or there will be *a total eclipse of the sun during such a year*, are also truths. The truths of physical science are mainly derived by inductive reasoning, and enable us to predict the future.

III. How Developed.—The Physical Sciences begin in the common observations of mankind. This common knowledge is, by the power of thought, gradually transformed into scientific knowledge. Through the operation of the natural laws of mental activity, the common knowledge of the race is constantly rising up into the higher and more perfect forms of science. The several elements that enter into their development are Observation and Experiment, Classification, Induction, Deduction, Hypothesis, and Theory.

Observation.—Observation has reference to the perception of nature as she presents herself to our view. By it facts and phenomena are presented to the mind through the senses, and are then retained in the memory for future use. In science, this observation needs to be careful and exact; mere looking or listening is not sufficient, we must look and listen with the eye of reason. Observation must be made with patience, and sources of error must be guarded against. It must also be analytic; facts and phenomena must be analyzed, things must be separated or broken up into fragments in order that the information may be minute and accurate. Man also invents instruments, as the microscope and telescope, to aid the senses in observation, and thus acquire facts which he could not otherwise obtain.

Experiment.—By Experiment, man puts nature into new relations to observe the results. He not only observes, but he prepares his facts for observation. Objects are placed in different relations and conditions, and the changes and results noted and compared. Nature is, as it were, put on the witness stand, and, by a series of cross questions, forced to reveal her secrets. This method of obtaining facts is largely used in Natural Philosophy, and in Chemistry it is in constant use.

Classification.—As facts multiply, the mind compares them and perceives points of resemblance between them, and forms them into classes. The perception of the similarities and differences is an act of *judgment;* the separating of the common qualities to unite them into a general scheme is *abstraction*, and the forming of the general class idea is *generalization* The arrangement of the objects themselves into classes is called *classification.* This process of classification is neces sary in all the sciences; but it is especially prominent in Natural History.

Induction.—Induction lies at the basis of the truths ot the Physical Sciences. Observation and Experiment give us the particular facts; Induction takes these facts and finds the laws which contain or control them. Thus from the facts that heat expands iron, zinc, copper, etc., we derive by Induction the general truth that *heat expands all metals.* It is this process of thought, so generally neglected by the an cients, and made so prominent in the Baconian system, that has given such rapid growth to the physical sciences during the last century.

Deduction.—The method of Deductive reasoning is also used in the Physical Sciences. Having reached a general conclusion by Induction, we apply this truth to new facts by a process of Deduction. Thus, if we discover a new metal, we immediately infer that heat will expand it, from the general principle that heat will expand all metals. The mathematician takes the doctrine of universal gravitation, puts it into an equation, and works out, in the solitude of his study, the position of a new planet; and the telescope, sweeping the field of the heavens, discovers the wanderer, and thus confirms "the immortal predictions of science." It is thus true that "Induction *discovers* principles, while Deduction *applies* them;" or as Tyndall observes, "In the study of Physics, induction and deduction are perpetually married to each other."

Hypothesis.—The Physical Sciences are aided in their development by Hypothesis. An Hypothesis is a supposition to account for facts and phenomena. The facts are presented through the senses, and the mind makes some supposition to account for them. Such suppositions, or hypotheses, have given us a large number of the truths of the physical sciences. Nearly all their great truths were once hypotheses. Kepler's law of elliptical orbits was once a mere hypothesis; he made and rejected nineteen before he discovered the true one. Newton's theory of gravitation was at first only an hypothesis; and when verified became an accepted truth.

Verification—Having formed our hypothesis, the next step is to prove it to be true. This is called its *verification.* To verify an hypothesis, it must be shown that it will account for all the known facts to which it relates. If facts are found that it will not account for, another supposition must be made, and so on until one is obtained that is correct. Great care, however, must be taken, not to accept an hypothesis as true until the facts are so numerous that there can be no doubt of its verification. "To try wrong guesses," says Dr. Whewell, "is, with most persons, the only way to hit upon right ones."

Origin of Hypotheses.—The hypotheses of science originate by what is called *anticipation.* Anticipation is the presaging of a truth before there is evidence to prove it. By the power of anticipation the mind leaps from a few facts to the law which governs them. All hypotheses are the result of what La Place calls a "great guess," or of what Plato so beautifully designates as "a sacred suspicion of truth." The forming of hypotheses requires a suggestive mind, a lively fancy, a philosophic imagination, that catches a glimpse of the idea through the form, or sees the law standing behind the fact.

Theory.—The Physical Sciences are largely made up of Theories. A Theory is an accepted explanation of facts and phenomena. It may also be defined as a verified hypothesis. When an hypothesis is shown to explain all the facts that are known, these facts being varied and extensive, it is said to be verified, and becomes a theory. Thus we have the theory of universal gravitation, the Copernican theory of the solar system, the undulatory theory of light, etc., all of which were originally mere hypotheses.

IV. Value of Physics.—The importance of the study of the physical sciences has, until recently, been largely overlooked in our systems of education. Language, mathematics, and the metaphysical sciences, were, for many years, the principal branches of a collegiate and academic course. It is but recently that the physical sciences have, to any large extent, been introduced into the curricula of our higher institutions; and in our common schools they are still almost entirely omitted. A few remarks are therefore appropriate concerning the value of these studies.

1. *The study of the physical sciences gives culture to the perceptive powers.* The physical sciences begin in the observation of the facts of the external world. The proper study of these sciences requires the pupil to observe these facts closely and accurately. They thus call the perceptive powers into constant and forcible activity; quicken and strengthen the power of the senses, and make the student sharp-eyed and accurate in his observation of things. Among all the studies, they especially, and almost alone, give culture to the perceptive powers.

2. *The study of the physical sciences gives culture to the power of classification.* The facts of the material world are created in classes, and the natural sciences embrace the classification of the facts, as well as the facts themselves. These classifications, in several of the branches, are the most perfect that can be found in science. The arrangement into species, genera, orders, and kingdoms, as in botany, zoölogy, etc., has no counterpart in the other sciences. The natural sciences, therefore, transcend all others in affording cultivation to generalization and classification. They, above all other sciences, tend to train the mind to the habit of the systematic and orderly arrangement of knowledge.

3. *The study of the physical sciences cultivates the power of inductive reasoning.* All the primary truths of these sciences are derived by induction. In their study we are con·

stantly passing from particular facts to the general laws of which they are examples. In no other sciences is the use of induction anything like so prominent. Though some of these sciences may rise into a deductive stage, yet the entire spirit of these branches is inductive. Induction is the genius which presides over their origin and development. The mind of the student is thus constantly occupied in inferring general laws from particular facts, and acquires the habit of reasoning in this way. The importance of such culture is seen in the fact that this is the kind of reasoning that we use in the questions that meet us in the ordinary duties of life.

4. *The study of the physical sciences tends to modify the dogmatic spirit cultivated by the deductive sciences.* The study of the deductive sciences tends to make the mind overbearing and dogmatic. The pure mathematician is as stubborn as a mule, in his belief. Accustomed to see certain conclusions flow from admitted premises, he applies the same method to social and political questions, and is intolerant of any opposition to his opinions. Natural science, leading the mind by the path of inductive thought, accustoms it to see how easy it is to be mistaken in an inference, and makes it cautious in its conclusions, and tolerant of doubt. The scientists are the most modest and the least positive in their beliefs of any class of thinkers; indeed, many of the points of difference between theology and science are the inferences of the theologians from the premises of science, rather than the claims of the scientists themselves. The fact that the pathway of the physical sciences is strewn with the remains of discarded theories, is sufficient to cultivate a spirit of modesty and charity.

5. *The physical sciences have contributed to the development of the material interests of mankind.* They have done much to lift man up out of a condition of barbarism and ignorance. They have enabled him to improve the tillage of the soil, to raise larger and better crops, to lessen and lighten his labor,

to establish manufactories, and in a thousand ways have ministered to his comfort and convenience. They have given him machinery by which he can multiply his strength and skill, and do that which his unaided powers could never accomplish. They have built his houses, covered the ocean with the white wings of commerce, laid rails to carry his products across wide continents, disseminated education by the invention of the printing press, and, by improving his material condition, enabled him to lift himself up into a higher civilization.

Objections.—Though the physical sciences are thus valuable to man, there are objections to the exclusive study of these branches. The natural tendency of such study is to lead to materialism in thought and philosophy. Accustoming the mind to the concrete, they unfit it to comprehend and appreciate abstract truth. They thus tend to lower the tone of man's thought and sentiment, to destroy the imaginative and poetic in literature, to take the divine element of inspiration out of art, and to weaken the religious faith of mankind. Though the sciences of geology and astronomy give grand ideas of the creation, and some of the other branches afford evidences of a marvelous design in organic life; and though some scientists have said that "the facts of the world are the thoughts of God," yet it must be admitted that the exclusive study of the physical sciences leads the mind naturally towards a hard, dry materialism, which has no place for the highest aspirations of the human heart, for God, Immortality, and Heaven.

CHAPTER II.

TEACHING GEOGRAPHY.

GEOGRAPHY treats of the facts relating to the surface of the earth. It seeks to describe and classify these facts, and to explain their causes and the laws which control them. The term Geography is derived from *ge*, the earth, and *grapho*, I describe, and means literally a description of the earth, and this was its primary sense.

I. NATURE OF GEOGRAPHY.—Geography is not so much a distinct science as a collection of facts and principles drawn from the other sciences. In its widest sense, Geography embraces all that we know of the earth; its form, size, motions, structure, present and past condition, products, inhabitants, etc. As usually treated, it runs into and embraces parts of several of the sciences, as astronomy, botany, zoölogy, etc., though it has a sphere of its own somewhat distinct from any of these other branches.

Division.—The most natural division of Geography seems to be into Physical and Political Geography. Physical Geography is that which pertains to the earth in its natural condition, including land, water, the atmosphere, the climate, and the distribution of the mineral, vegetable, and animal kingdoms. Political Geography is that which treats of the earth as modified by man,—its countries, cities, towns, and inhabitants, including their customs, religion, government, etc. Popularly, however, the term Physical Geography has been used to include the philosophy of geography, embracing the generalizations of the science and a discussion of the causes and laws of geographical phenomena.

Besides these divisions, writers speak of Local Geography, Descriptive Geography, Mathematical Geography, Historical Geography, etc. All of these have a special meaning, and are convenient in instruction, though they do not indicate scientific divisions of the subject. The division which comes nearest the present actual usage is that into Descriptive and Physical Geography; the former treating of the facts of geography, and the latter of the laws and causes of geographical facts.

Origin.—Geography is a comparatively modern science. The geographical knowledge of the ancient Egyptians and Phœnicians was confined to the shores of the Mediterranean Sea. The military expeditions of Alexander, in the fourth century B. C., extended the knowledge of the Greeks considerably. Eratosthenes, about 200 B. C., first reduced the geographical knowledge of the Greeks to a scientific form. Strabo and Ptolemy wrote treatises upon the subject, which contained nearly all that was known by mankind for several centuries. Prince Henry of Portugal, called the Navigator, added considerably to this knowledge during the fifteenth century. The discoveries of Columbus, however, opened up a new world and gave a new impetus to the discovery of geographical facts. The geographical societies of France and England have contributed largely to geographical knowledge during the last 50 or 60 years.

The first text-book on geography published in this country was a small 18mo. manual by Jedediah Morse, issued in 1784. This was the principal text-book until 1822, when William C. Woodbridge and Mrs. Emma Willard issued a work entitled *The Woodbridge and Willard Geographies and Atlases.* In 1823, Sidney E. Morse published a work entitled a *New System of Modern Geography*, which was several times revised and had a wide and long continued circulation. Some of the principal writers who followed Morse were Olney, Smith, and Mitchell, the works of the latter author being especially popular.

The earliest text-books made local geography very prominent, some works containing very little description. In instruction, also, the description of geographical facts was generally neglected. By degrees the descriptive part became more prominent, both in text-books and in instruction. The next step in advance was the attempt to classify the facts of geography, and to present their laws and causes. The labors of Humboldt and Ritter in this respect were introduced into this country by Guyot in his lectures, and in a work entitled *The Earth and Man.* Several works were soon prepared on Physical Geography, in which the facts were classified into systems and their causes and laws explained. Recently attempts have been made to combine this with the local and descriptive geography in text-books for young pupils; but not with entire success. One or two series that claimed such a combination as an especial merit, were found not to work well in the class-room, and had to be revised and made to conform more to the idea of presenting the facts of the subject before its philosophy.

II. METHODS OF TEACHING GEOGRAPHY.—There are two distinct Methods of Teaching Geography, which are appropriately distinguished as the Analytic and Synthetic methods. The analytic method begins with the world as a whole and passes by successive division down to the state, county, and town or city, in which one resides. The synthetic method begins at the smaller division and passes by successive enlargements to the entire surface of the earth. There is also the Inductive Method which begins with particular facts and passes to their generalization and laws; and the Deductive Method which begins with a general view of geographical facts and passes to particulars. Some German writers speak also of the Constructive Method; but this seems to be a mere appendage to the other methods, and not a distinct method of itself.

Synthetic Method.—The Synthetic Method begins at home and passes by successive additions over the whole globe. It starts with the school-house and yard, takes in the surrounding farms, then passes to the township, the county, and the state, from the state to the United States and the Western Hemisphere, and at last covers the entire globe.

Several reasons can be given in favor of the synthetic method. First, it seems to be more in accordance with the principle, from the known to the unknown, as it passes from the familiar things around us that we can see, to those that are distant and can only be conceived. Second, the pupil thus first gains a knowledge of the geography of his own county and state, which it would seem is of more importance to him than a knowledge of remote countries of which he seldom hears or reads. The second consideration is especially important if the time for the study is restricted or accidentally curtailed, since the remote parts of the globe would thus be omitted rather than those with which his life will be most closely connected. An objection to the method is that the attempt to carry it out strictly and completely would make the course very tedious or lead to tiresome repetitions. A further objection is that the mind generally prefers to operate analytically, passing from a general view of the whole to a detailed consideration of its parts.

Analytic Method.—The Analytic Method begins with the globe as a whole and by successive divisions passes to the various parts of which it is composed. It divides the earth into land and water, comes down from the continents to the countries, states, counties, and townships, and from the large bodies of water to the smaller ones. This method is the reverse of the synthetic method, beginning where that ends, and ending where that begins.

There are several reasons in favor of the analytic method. First, it admits the early introduction of the globe. It thus gives a more correct idea of the relations and comparative size of the different countries, and prevents some of the wrong conceptions that inevitably flow from the other method. Second, it enables us to present earlier the astronomical elements of geography; such as the changes of day and night, the changes of the seasons, the nature and the use of latitude and longitude, etc. Third, it follows the general law of acquisition,—from the whole to its parts, or from the larger part to the smaller part, instead of from details to the whole.

Inductive Method.—The Inductive Method begins with the particular facts of the science and passes to their classification into systems. It is in spirit the method by which the subject has been taught for many years, although until recently the course did not pass beyond the facts of the subject. It is the manner in which it is now presented by those authors who follow their work in descriptive geography by a work on Physical Geography. To carry out the method fully, we should begin with the facts of geography around us that we can perceive before we learn to define or describe them.

Several reasons can be given in favor of the Inductive Method of teaching geography. It corresponds with the primary law of mental development, from the particular to the general. The mind naturally learns facts before it learns to classify them into general systems. It is thus much easier than the deductive method, which requires the grasp of a general system before the mind is familiar with details.

Deductive Method.—The Deductive Method of teaching geography begins with a general view of the facts, and passes to the particulars embraced in the general system. It seizes upon the laws or general characteristics of a group of facts, and interprets the particular facts from the conception of the group. Thus, from river systems it passes to particular rivers from mountain systems to individual mountains, from facts that stand in the relations of cause to the effects which they produce, etc. The method is analytical in its nature, but is more than analytic, since it not only goes from the whole to its parts, but from the general to the particular.

There are several advantages and disadvantages in this method. It is unsuitable to the beginner, as it inverts the law of mental development, from the particular to the general. It is not surprising that the recent attempts to introduce it into our elementary text-books on geography were unsuccessful. It is of great value to the advanced student, for it aids him in remembering and understanding the details as he sees their causes, and looks at them through their relation to a general scheme or law. It is not surprising that the method when first presented was so attractive to adult minds, and this will account for the fact of the enthusiastic approval of certain text-books which did not meet expectation in the actual work of the school-room.

III. Courses in Geography.—There should be three distinct courses in teaching geography. First, there should be a course of lessons for beginners, giving the general ideas and facts of the subject; second, there should be the detailed study of geographical facts; and third, there should be a course in the philosophy of geography. The first course may be called Primary or Elementary Geography; the second, Descriptive Geography; the third, Physical Geography.

Primary Geography.—The primary course in geography includes the leading ideas and facts of local and descriptive geography. It is designed to present to children their fundamental knowledge of the subject. The instruction should be given orally in connection with illustrations, the globe, and outline maps, the pupils not being required to study the subject from a text-book.

The primary course embraces several distinct stages: first, a *perceptive stage;* second, a *conceptive stage;* third, a *representative stage;* and fourth, an *explanatory stage.* The first and second of these stages should be most prominent in the primary course; but the elements of the representative and explanatory stages are also to be presented.

Descriptive Geography.—The second course embraces a detailed description of the facts of geography. These facts are to be learned from text-books, and presented by the pupils in topical recitations. It is a detailed course in descriptive and local geography, following the attainment of the fundamental ideas given in the primary course. It combines both the analytic and synthetic methods of treatment, but employs principally the analytic.

Physical Geography.—The third course includes the classification of the facts of geography into systems, and also the discussion of the causes of geographical phenomena, and the laws which govern them. It is the philosophical stage, and has been treated by American authors under the head of Physical Geography.

I. Teaching Primary Geography.

The course in Primary Geography includes that elementary instruction which imparts the fundamental ideas and facts of the science. It embraces four distinct stages; the Perceptive, the Conceptive, the Representative, and the Explanatory stages. We shall first speak of the Principles of Instruction in this course, and then show the Methods of Teaching in each one of these four stages.

I. Principles of Teaching.—There are several general principles which should guide us in teaching primary geography. These principles may seem very simple; but they have been constantly violated by teachers, and even by those who were regarded as intelligent and successful instructors of the branch.

1. *The course of instruction in primary geography should be given in the concrete.* The geographical ideas should be presented to the mind of the learner by illustration, rather than by description. This can be done by *showing the objects* in nature, or by having *models* of them or *pictures* of them. When it is possible, the pupils should be shown the physical features; as a mountain, river, lake, island, cape,

isthmus, peninsula, etc. Many of these can be seen in miniature in nearly every neighborhood. We may go out by the riverside, or even by the side of a small stream, and study geography. To take the pupils out into the yard after a rain and study geography in a "mud puddle," would be better than the ordinary abstract methods of the school-room.

Good pictures of these objects will also be valuable in leading pupils to clear conceptions of them. The so-called "geographical box," or what is still better, the *modeling in sand* on the "moulding board," will be found very useful with beginners in geography. The apparatus found at our late Centennial Exhibition indicate European methods of teaching geography, and are worthy of our imitation.

2. *The course of instruction in primary geography should be first synthetic and then analytic.* We should begin geography at home, in the school-house and yard. From this we should go out to the surrounding fields and neighborhood. A short course on the map of the township, county, and state may be given. We should then, and perhaps earlier, pass to a conception of the world as a whole, and study it analytically. We first separate the surface into the two great divisions, land and water; then come down from the continents to countries, states, counties, and townships. Thus, though we should begin with the synthetic method, we should be careful not to continue it too long, as the pupil will study the subject much more satisfactorily by the analytic method than by the synthetic method.

3. *The course of instruction in primary geography should present facts before giving their classification and causes.* This principle is in accordance with the natural laws of mental acquisition. It accords also with the historical order of the development of the science. The facts of the science were known long before their classification. Physical Geography, as presented in our text-books, is much more recent than Descriptive Geography. The attempt to invert this order,

which has been made in some of our recent text-books, was a mistake; and it is no wonder that the books needed early revision. The facts of local and descriptive geography must precede the attempt to generalize these facts into a system. There must be some knowledge of the individual rivers, mountains, etc., before a pupil is prepared to appreciate river systems, mountain systems, etc.

4. *The course of instruction in primary geography should begin with local and descriptive geography.* The child is interested in and can readily understand and remember local geography. He carries in his mind the picture of the map and the location of places, rivers, etc., and has little difficulty in remembering their names. To restrict the pupil, however, to local geography, as is too often done, is a mistake. The teaching of mere names and places is a waste of time, for a large number must necessarily drop out of the memory. The drilling, day after day, upon "map questions" without any description, is of little value to pupils.

The description of places should be joined to the location of places. Interesting facts should be associated with the locations, for they will not only be of value themselves, but aid in fixing the location in the memory. That which was merely a "spot on the map" with a name, becomes a living reality to the pupil when interesting facts are associated with it. These facts may be given and then the place located; or we may pass from the location to the description. In practice, the latter method will be usually found more convenient. Local geography may thus precede, but it should carry with it descriptive geography. After locating a country and pointing out its principal cities, rivers, etc., the teacher should give and then require a description of its striking features, of its important events, of its people, their habits, employments, etc.

5. *The course of instruction in primary geography should include historical geography.* In teaching geography, the leading historic events should be associated with the places

described. As we describe the different countries, reference may be made to the leading events of their history. In connection with the geography of the Old World, facts concerning Cyrus, Xerxes, Alexander, Cæsar, Charlemagne, Alfred, Wallace, Bruce, Napoleon, the Crusaders, the Spanish Armada, etc., may be related. In considering the Western Continent, the story of its discovery, the course of the vessels, the place of landing, accounts of early settlements, encounters with the Indian tribes, etc., should not be omitted. The principal facts concerning the settlement of the several States of the Union may be presented in connection with their geographical description; and in describing cities, mention should be made of the principal events that took place in them. and of the eminent men who have lived there.

Celebrated buildings, like Girard College in Philadelphia, lead naturally to the statement of facts in the lives of their founders. St. Peter's at Rome and the Vatican could not be passed over without telling of Michael Angelo and Raphael. Westminster Abbey leads one to tell of its founder and the great men who sleep there; Faneuil Hall will suggest the deeds of Warren and Adams; Independence Hall in Philadelphia will remind one of the signers of the Declaration of Independence and the Bell of Liberty. The same method may also be applied to natural features. The Hudson River will remind us of Hendrick Hudson; Lake Erie of the victory of Perry; Boston Harbor of the great tea-party; Lookout Mountain of Gen. Hooker; Vicksburg of Gen. Grant, etc. Such an association of historic events with places will give a life and reality to the places, and link them to the memory by the tie of interest.

6. *The course of instruction in primary geography should be practical.* The teacher should aim to make the subject life-like and real. It is surprising how abstract and theoretical the knowledge of geography often is with young pupils Their knowledge of the map is often merely the idea of so

many lines and black spots on paper. The directions of countries from each other are often all confused by the section map they studied, and the position of the seats in the school-room. Ask them to point to Europe, and they will as soon point north or west as east. We have seen children who were reciting on the map of Brazil point north for South America.

The teacher should be careful also to present those facts which are the most important to be known. There is no use in remembering all the little rivers of Africa or the smaller towns of Europe, the exact areas of states, and the population of most of the cities. The teacher should also aim to connect the facts with everyday life. Let him bring in a newspaper and read of events occurring in different places, and have the pupils to locate these places. Call attention to railroads, lines of steamers, etc.; and show them how we should travel by land or water from one place to another. Show also how one country is adapted for manufactures, another for commerce, etc. Endeavor to make the subject a reality in the mind of a child, and not a mere collection of words or abstract marks on a map.

7. *The course of instruction in primary geography should be given orally.* For primary pupils no text-book is needed. To have them study the subject in a text-book at first, is to have them commit words instead of learning geography. The teacher needs a globe and outline maps, but no text-book for the first year or two in teaching primary geography. The ideas of geography are to be presented by real objects, or by models or pictures of them. Localities are to be pointed out on the map and globe, and the descriptions given verbally by the teacher and remembered and repeated by the pupil. After stating a fact, the pupil should repeat it, and the facts given in one lesson should be repeated at the next lesson. Facts learned in this way will possess an interest for the pupil and make a permanent impression on his memory.

II. Method of Teaching.—We now present the course of instruction in Primary Geography. The lessons should be given in the following order: 1. The Perception of geographical facts; 2. The Conception of geographical facts; 3. The Representation of geographical facts; 4. The Explanation of geographical facts.

1. ***The Perception of Geographical Facts.***—The first step in teaching geography is to give the pupils geographical ideas through the senses. It is a geographical lesson on that which the pupils can observe for themselves. It employs the objects of the world around us, or models or pictures of them. This stage will include lessons on Land, Water, the Soil, the People, Animals, Plants, and Minerals.

Nature of the Lessons.—Lessons on Land will include lessons on hills, mountains, plains, islands, capes, isthmuses, etc. Lessons on Water will include springs, ponds, rivers, lakes, bays, straits, etc. Lessons on Soil will include the different varieties of soil found in the neighborhood. Lessons on the People will include the looks, manners, habits, education, religion, etc., of the people of the town or vicinity. Lessons on Animals include the domestic animals and the principal wild animals, the birds, the insects, etc., found in the vicinity. Lessons on Plants include the trees of the yard, orchard, and forest, and many of the principal plants and flowers. Lessons on Minerals include quartz, limestone, sandstone, and such other minerals as are common to the place, or of which specimens can be obtained.

The Method.—The method of teaching the primary ideas and facts of geography should be concrete and inductive. The objects, or models or pictures of them, should be presented to the pupil, if possible. We should also pass from the ideas to the terms which express them; and from a clear idea of the meaning and use of a term to its definition.

Lessons on Land and Water.—The pupils should be taken out of doors and shown the divisions of land, and be taught their names. They may be shown a hill, or a mountain, if there is one in the neighborhood. They should be taken down to the river that they may see an island, a cape, a peninsula, an isthmus, etc. The teacher should also show the different divisions of water and give their names. Representations with the "moulding board" or the "geographical box," will be of great advantage to the pupil. Such a box can be easily made, with depressions and elevations carved in the wood, and water poured in it, to represent the different physical features. The divisions of water and land can also be represented on the blackboard. A little water poured upon the school-room floor can be made to serve the same purpose.

Other Lessons.—Pupils should be shown the different varieties of soil, as sandy, clayey, etc.; their adaptation to different kinds of crops, etc. They should be taught to observe and describe the peculiarities of the people, their language, customs, occupations, interest in education, religious beliefs and customs, etc. They should also be taught the names of all the ordinary trees of the neighborhood, and to distinguish them by their leaves, bark, and the grain of the wood; and also the names, habits, and peculiarities of the animals of the neighborhood, as is indicated in the system of object lessons. Such a drill will give knowledge which will serve as the basis for learning about such things distant from home, and enable the instruction to pass from *the known to the unknown*. The student-teacher will exemplify this stage in a model lesson.

2. ***The Conception of Geographical Facts.***—The Perception of geographical facts should be followed by the Conception of those which cannot be perceived. From a knowledge of that which the pupils can see, they should be led to a knowledge of similar things of which they can conceive. The objects of perception thus become the basis of objects of conception. These two stages may to a large extent go hand in hand in actual instruction.

Nature of Lessons.—The lessons on Land include mountains, plains, prairies, deserts, table-lands, volcanoes, etc. Lessons on Water include rivers, bays, gulfs, straits, channels, lakes, oceans, etc. Lessons on People may include the Indians, Hindoos, Chinese, Japanese, Esquimaux, Africans, etc. Lessons on Animals include lions, tigers, bears, wolves, monkeys, elephants, alligators, the ostrich, the condor, the eagle, etc. Lessons on Plants include the tea-plant, coffee-plant, cotton-plant, bread-fruit, banyan-tree, cinnamon-tree, etc. Lessons on Minerals include iron, zinc, copper, lead, coal, gold, silver, diamonds, etc.

Method of Teaching.—The method of teaching should, so far as possible, pass from the perception of the known to the conception of the unknown. Beginning with some visible object, the mind may be led to conceive the invisible. The facts of sense thus become the basis of the ideas of conception; the thing seen becomes the representative of the thing to be conceived. By means of the imagination we, as it were, transmute the real object into the ideal conception.

Lessons on Land.—To give a pupil an idea of a Mountain, let him think of a hill which he has seen, and imagine it to grow higher and higher until it is half a mile, a mile, two miles, three miles, etc., high; its top crowned with clouds and on its summit resting perpetual snow. In this manner a pupil may obtain quite a definite idea of a mountain. Then let him imagine it to begin to stretch out further and further away until it reaches many miles beyond the horizon; this will give an idea of a mountain range.

To conceive of a Prairie, have the pupil think of a meadow and then imagine it to begin to spread out in every direction, further and further away, until it reaches many miles in extent; let him imagine the grass growing as high as his head, adorned with a profusion of rich flowers, and inhabited by prairie birds, herds of buffaloes, and droves of wild horses. It will add interest to the conception to describe a prairie on fire, the flames traveling with great speed, and buffaloes and droves of wild horses flying in fright before them.

A Desert can be conceived by beginning with a small level area of sand, and imagining it to spread out in every direction until it covers an extent of many miles—a waste of parched sand, dotted here and there with bright green oases. They may also be led to see the caravans crossing the desert, with the camels and horses, now stopping at an oasis, and now overtaken by a storm of sand from which they can escape only by dismounting and covering their faces, and by which they are often buried in a sandy grave.

Other Lessons.—In a similar manner, a rivulet may be enlarged into a river, a pond into a lake, a lake into an ocean, so wide that it will take ships weeks to sail across it. Vivid conceptions of the people may be given by life-like descriptions of them, as the Chinese with their habits so opposite to ours, the Hindoos, with their dreamy beliefs and cruel religious rites; the Indians, with their wigwams, bows and arrows, and war dances; the Esquimaux, with their ice-huts, dogs, and sledges. Ideas of animals, plants, etc., can also be given by descriptions and pictures of them.

Adaptation.—These facts should be adapted to the capacity and taste of the pupils. The teacher will readily see what things are interesting to the young learner, and will be able to tell how far to enter into details in his lessons. Much of the interest will be due to the manner of the description; and it will afford the teacher an excellent opportunity to cultivate an easy and artistic method of describing objects. Let it be remembered that it is the author's opinion that *no teacher is competent to teach geography until he is able to give such descriptions.* The student of teaching should learn how to give the lessons suggested, and extend the method to other things in the course.

3. ***The Representation of Geographical Facts.***—The next step in geographical instruction is the representation of geographical ideas on paper in the form of a map. This stage

includes both the Drawing of Maps and Lessons on Maps. It begins with giving an idea of direction, then showing how to indicate direction, then the making of a map, then the study of outline maps.

Direction.—The first thing is to teach a pupil the different directions. We may do this by having him stand with his face to the north, and arms extended, the right hand pointing to the east, and the left hand to the west. The rising and setting sun will indicate the east and west; and it will be well to have the pupil fix the north by observing the position of the North star in the evening.

Indicating Directions.—The next step is to indicate these directions. Draw a north and south line on the floor, and across it an east and west line; and call attention to the direction of objects from the point of crossing. Then draw these lines on a *horizontal slate* or piece of paper, place the pupil at the south end of the slate or paper, and lead him to see that the side next to him is south; the side from him is north; the right-hand side, east; and the left-hand side, west.

Relative Directions.—These are now *absolute* directions; the next step is to lead to the idea of *relative* directions. To do this, we represent on slate or paper some of the objects in the school-room, indicating their directions from one another. We then gradually change the position of the slate or paper, still calling attention to the fact that the right hand indicates east, the left hand west, the upper part north, etc., and that the objects represented have the same relative directions. Great care is to be exercised in this lesson, that the pupil may have a correct idea of the relative directions indicated on the map.

Making a Map.—The next step is to make a map of the school-room, locating the different objects, the teacher's desk the platform, the stove, etc. Then make a map of the school-yard, locating the objects in it. Then include in the map the neighboring fields and the different farms, locating the roads.

the woods, the farm-houses, the barns, etc. Then let the pupils draw maps of their own homes, their gardens, the streets of the village, indicating the principal buildings, etc. They may also draw imaginary maps.

Lesson on Maps.—We should next pass to the map of the township, county, or state, or a map of the United States or the world, as the teacher prefers. The pupil should then have a regular drill on maps, and learn what is called Local and Descriptive Geography. These lessons may include: 1. The pointing out and naming of localities; 2. The description of geographical features; 3. Some of the principal historical events relating to countries and places.

Map Drawing.—The elements of Map Drawing may now be introduced. The first lessons should be entirely by *imitation.* No method of triangulation or the use of construction lines should be used. The pupil will look at the map, and then try to draw the map from memory. At first, if he wishes, he may put a thin piece of paper over the map of an atlas and trace the outline. It will aid in giving a more definite idea of the contour, and will serve as an introduction to constructing a map from memory. Maps should be drawn on the blackboard as well as on paper.

4. ***The Explanation of Geographical Facts.***—The pupil is now prepared for the Explanatory Stage of Geography. This includes the explanation of geographical facts and phenomena, especially those pertaining to the astronomical elements of geography. It includes the Form of the Earth, the Motions of the Earth, the lines of Latitude and Longitude, the Circles on the globe, including the Equator, the Tropics, the Polar Circles, and the Zones.

Form of the Earth.—The teacher should begin by calling attention to the *apparent* form of the earth. Then tell them it is round like a ball, and show its form by a globe. Give also some of the simple proofs of its rotundity, as the appearance of a vessel approaching or receding from the shore, the sailing around it, etc. A magnetic globe will illustrate the first proof. We then show that the surface of the earth consists of land and water, point out the land and the water, name the different grand divisions of land and water, and explain their form, position, etc.

The Equator, etc.—The next step is to call attention to the various *circles of the globe* and explain their uses. The equator, parallels, and meridians should be introduced by showing their use in locating objects. To illustrate, suppose we mark an object on the globe; we must look over the entire surface to find it. But suppose we draw a line around the middle of the globe and say the object is above or below this line, then you need look over only one-half of the surface to find it. Then suppose we draw lines parallel to this line, which we call the *Equator*, and say the object is on one of these lines; now you need look only on this line to find it. Suppose now we draw a line from the top down through the object; we can locate it exactly by the intersection of these lines, or by saying it is so many units above the equator and so many units to the right or left of a given line.

We then give their names, *equator*, *parallels*, and *meridians*, and explain the division of the circle into degrees, etc. We then drill in finding latitude and longitude of places, and in finding places by the latitude and longitude. We may also show them that the extent of latitude is 90°, and of longitude 180°, and lead them to see what places have no latitude, no longitude, no latitude and longitude. In this way pupils may be given a much clearer idea of the nature and use of parallels and meridians as locating lines than they usually possess.

Motions of the Earth.—The next step is to teach the two motions of the earth. The diurnal motion may be illustrated by the revolution of a globe on its axis, showing the phenomena of day and night, sunrise and sunset. The apparent motion of the sun may be illustrated by the common experience of the apparent motion of a railroad train when at rest. The annual motion and its effects may be illustrated by a tellurian, or in its absence, by an apple or a pumpkin, carried around a lamp representing the sun. The common globe may also be carried around some object representing the sun, care being taken to keep the axis always parallel to its first position, inclined about $23\frac{1}{2}$ degrees. A very clear idea of the change of seasons, etc., can be given in this way.

Axis of the Earth.—The next step is to call attention to the *axis* of the Earth, as the centre of its motion. Explain that this is inclined to the *orbit* about $23\frac{1}{2}°$, that it is always parallel to a given position, and that the ends are called *Poles*, etc.

Circles and Zones.—The next step is to explain the *tropical* and *polar circles.* This may be done by the tellurium, or by carrying the globe around a lamp, or by charts or diagrams on the board. Let them see that in one part of the orbit, the sun shines $23\frac{1}{2}°$ over one pole and lacks $23\frac{1}{2}°$ of reaching the other pole, which will fix the *polar circles.* Let them see that in one position the sun is exactly over a point $23\frac{1}{2}°$ above the equator, and in another over a point $23\frac{1}{2}°$ below the equator, which will fix the *tropical circles.* Then explain the meaning of a *zone* or belt, and let them see that the *cold* or *frigid zones* are $23\frac{1}{2}°$ wide; that the *hot* or *torrid zone* is $23\frac{1}{2}°+23\frac{1}{2}°$, or $47°$, wide; and that to find the width of each *temperate zone*, we add the width of the frigid and the torrid on one side of the equator, and subtract the sum from $90°$; thus, $23\frac{1}{2}°+23\frac{1}{2}°=47°$; $90°-47°=43°$.

Lessons on Zones.—Lessons may then be given on the productions of the different zones; their animals, trees, etc.; the difference in the inhabitants, their occupations, etc. The appearance of the moon, stars, and sun in circling the heavens, the long twilight, the long nights of winter, etc., of the frigid zones, will be interesting to the pupils; also an account of the efforts to reach the North Pole.

Remarks.—Such a course should be given in connection with the conceptive and representative stages of the subject. The lessons, as indicated in these stages, may be continued several months, indeed, in a graded school they should be continued for several years, before the pupil takes a text-book to study. The principal part of the course will be the local and descriptive elements; the maps of all the countries should be studied, and the most interesting facts stated to the pupils.

If the pupils have a book, containing a few of the more interesting facts, to read (not to commit for recitation), it will add interest to the lesson, and give them something to look at outside of the recitation. The teacher should make out an outline of a little *text-book on geography*, and follow this course in his instruction. It will add greatly to the teacher's knowledge and to the interest of his pupils. Indeed, a teacher who is not able to carry out such a course in geography, is so far not thoroughly prepared to teach the subject.

II. Teaching Advanced Geography.

The Advanced Course in Geography embraces a full school course in local and descriptive geography. It includes the formal study and recitation of the subject. The pupils are expected to study the lesson in a text-book, and come to the recitation prepared to recite what they have learned. We shall speak briefly of the Principles of Instruction in this course, and of the Methods of Teaching the course.

I. Principles of Teaching.—There are several principles by which the teacher in the advanced course in geography should be guided. The three most important are the following:

1. *The course in advanced geography should be analytic rather than synthetic.* We should begin at the world as a whole, and study from the whole to its parts, or we should

begin with a larger division and come down gradually to the smaller divisions of countries. The course should proceed from the general to the particular; from the whole to its parts.

2. *The course in advanced geography should extend to the classification of geographical facts.* The child begins geography with details, but it will be of advantage to group these details into classes or systems of facts. Thus, after a knowledge of several of the particular rivers of a country, we may classify them into river systems, and study them as such. So from a knowledge of individual mountains we may pass to their classification into systems, and study the mountain systems of the globe. The method to be pursued is thus inductive rather than deductive.

3. *The course in advanced geography may also include an inquiry into the causes of geographical phenomena.* The facts of geography will include some of the striking facts and phenomena of the globe, and the child will naturally inquire after the causes of them; and it will be well to gratify this inquiring spirit. We may explain the causes of volcanoes, earthquakes, hot springs, ocean currents, etc. We may call attention to the circumstances which determine the location of cities, the causes of the prosperity of nations, the reason for certain industries, etc. Such instruction may be mingled with the facts of the course, or it may be presented at the close of the book, or in the form of a general review of the subject.

II. Methods of Teaching.—The course in advanced geography should include the following subjects: 1. Definitions; 2. Description; 3. Lesson on Maps; 4. Drawing Maps; 5. Interesting Facts; 6. Imaginary Travels; 7. Geographical Outlines; 8. Classification and Causes of Geographical Facts.

1. ***Definitions.***—Pupils should be required to give definitions of the principal terms used in geography. Thus, they should be required to define a *river*, a *lake*, an *ocean*, a *hill*, a *mountain*, an *island*, etc. In these definitions we cannot

always pretend to scientific accuracy, but it is thought to be of advantage to the student to give statements approximating such definitions as closely as possible. The ideas of these geographical objects were obtained in the elementary course; the pupil should now be required to express these ideas in the form of definitions.

2. ***Descriptions.***—The pupils should also be required to learn the descriptions as given in the text-book, and to present the same in the recitation. They should not commit the text verbatim, but be encouraged to give the matter partly in their own language. The recitations should be largely topical, though points omitted may be brought out by questions. The descriptions may be given in connection with the map or without it. The pupil should learn to describe away from the map as well as on it; for in his reading he will not have the map before him, and he must learn to conceive geographical localities without the map. The pupils may be encouraged to give any facts bearing upon the subjects considered, not found in the text-book used in the school.

3. ***Lessons on Maps.***—In connection with the descriptions there should be constant lessons on maps. Pupils should be thoroughly drilled in local geography, for they need to know the location of places. For this purpose pupils should have atlases, and there should be outline maps in the school. These lessons on maps may be given in several different ways. First, the pupil may stand at the outline map, and with a pointer point out and name localities. Second, one pupil may point out and another pupil may name the places indicated. Third, one pupil may stand at his seat and name certain places, and another pupil standing at the map, may point them out. Fourth, the teacher may point out and the pupils name, or the teacher name and the pupils point out places. Care is to be taken that the map is made a means to and not the end of geographical knowledge; a knowledge of the position of so many lines and spots is worthless, unless they are suggestive of the realities of nature.

4. ***Drawing Maps.***—The pupils should be required to draw maps as well as to study them. There are several reasons for map-drawing in the study of geography. First, it aids the pupil to fix the physical features in the memory, by requiring a closer and more minute observation than is necessary for mere description. Second, it begets a habit of close and accurate observation in the study of maps. Third, it gives skill in representation, which may be of advantage to the pupil in many circumstances in life.

Methods.—There are two methods of map-drawing; that of simple *imitation* and that of *construction lines.* By the former method, the pupil looks closely at the map, and then endeavors to reproduce it by merely imitating the model. By the other method, certain lines are drawn to guide the pupil in obtaining the correct form and outline. With young pupils we should depend mainly on imitation; with older pupils construction lines may be used with advantage. The system of construction should, however, be simple; the complicated systems of some authors are a waste of time.

5. ***Interesting Facts.***—The teacher should add to the text interesting geographical and historical facts. In no subject taught in the common schools is there such a fine opportunity for the teacher to use his general knowledge, and awaken an interest in the study by additions to the text-book. The knowledge gained by travel or reading descriptions of foreign countries, can all be made available in the geography class. The study of good works on travel will be of great advantage to the geography teacher; and we recommend him to read such works extensively. Photographs of celebrated places, cities, buildings, natural scenery, etc., will add greatly to the interest of pupils. There should be a stereoscope and a collection of views in every public school.

6. ***Imaginary Travels.***—Much interest can be awakened by means of imaginary travels and voyages. These may be given in several different ways. First, the teacher may inquire

how we may travel from one place to another, as from New York to Chicago; and have the pupils point out and describe the trip. Second, the teacher can describe a trip or voyage, giving a description of the places at which he stops, not their names, and have the pupils name the places from the description. Third, the pupils may be required to prepare descriptions of imaginary travels and voyages, the class naming the places as they are described.

7. ***Geographical Outlines.***—The pupils are now ready to classify their knowledge of geography, and they should be required to commit and use an outline in describing the different countries. Such an outline will be valuable in aiding them to collect and remember geographical facts. With such an outline, they can acquire the knowledge from different books, if it is desired; all that is needed is that the facts they know be grouped according to the same method.

The following is a simple and convenient outline. It may be used in connection with any country or state, by making such slight modifications as the subject naturally suggests.

1. Position, etc.
   1. Position.
   2. Extent.
   3. Contour.
2. Natural Features
   1. Land.
   2. Water.
   3. Climate.
3. Products.
   1. Natural
      1. Animal.
      2. Vegetable.
      3. Mineral.
   2. Artificial
      1. Animal.
      2. Vegetable.
      3. Manufactures.
4. The People
   1. Appearance.
   2. Customs.
   3. Pursuits, etc.
5. Their Works
   1. Cities and Towns.
   2. Public Works.
   3. Buildings, etc.
6. Institutions
   1. Government.
   2. Education.
   3. Religion.

IV. Teaching Physical Geography.

Definition.—Physical Geography, in its literal sense, treats of the physical features of the earth, that is, of the earth as unmodified by man. In this country, however, the term has acquired a special signification, meaning the philosophy of geography. In this sense, it treats of the classification of geographical facts into systems, and presents the laws and causes of these facts.

Methods of Teaching.—Little need be said concerning methods of teaching the subject. The pupil will study it from a text-book and recite it. The general recitation should be topical; but the teacher should see by questions that the pupil understands the subject. Illustrations on the blackboard should be constantly required, and some charts and apparatus will occasionally be of service. The best books we have examined upon the subject are Warren's, Mitchell's, and Houston's; but Guyot's *Earth and Man* should be in every teacher's library.

Divisions.—The subject may be treated under the divisions indicated by the following *Outline:*

- I. Earth as a Planet.
  - 1. Form and Size.
  - 2. Motions and Orbit.
  - 3. Circles and Zones.
  - 4. Times and Seasons.
- II. The Land.
  - 1. Inside of Earth.
    - 1. Internal Heat.
    - 2. Volcanoes.
    - 3. Earthquakes.
  - 2. Outside of Earth.
    - 1. The Structure.
    - 2. Distribution of Land.
    - 3. General Forms.
    - 4. Special Forms.
- III. The Water.
  - 1. Continental Waters.
    - 1. Springs.
    - 2. Rivers.
    - 3. Lakes.
  - 2. Oceanic Waters.
    - 1. The Ocean.
    - 2. Ocean Movements.
    - 3. Ocean Currents.
- IV. The Atmosphere.
  - 1. Properties.
  - 2. Temperature.
  - 3. Moisture.
  - 4. Winds.
  - 5. Climate.
  - 6. Storms.
  - 7. Electric and Optical Phenomena.
- V. Organic Life.
  - 1. Botany.
  - 2. Zoölogy.
  - 3. Ethnography.

HISTORY.

CHAPTER I.

TEACHING HISTORY.

HISTORY is a narration of the events which have occurred among mankind. It describes the past actions of mankind, the rise and fall of nations, and the changes in the political and social condition of the human race. In its higher departments, it seeks also for the causes which have been operative in producing these events. The term is derived from the Latin *historia*, which is from a Greek word of nearly the same form, meaning to learn or know from inquiry. The word was first used by Herodotus near the beginning of his work; and it is supposed that he thus fixed the sense in which it has since been used.

Divisions.—History is divided into two great branches; the *Facts of History*, and the *Philosophy of History*. The Facts of History embrace the orderly and systematic statement of the events that have occurred in the lives of individuals and nations. The Philosophy of History endeavors to ascertain the causes which have contributed to produce the different changes in society and nations, and from these to predict the future condition and destiny of mankind.

History is also divided into *Ancient*, *Mediæval*, and *Modern* History. Ancient History is considered as ending about 476 A. D., the date of the destruction of the western division of the Roman empire; Mediæval History, or the history of the Middle Ages, extends from 476 A. D., to very near the discovery of America by Columbus; Modern History begins at or near the discovery of America, and extends down to the present time. History is also divided into *Sacred* and *Profane;* and still other divisions are sometimes made.

The Facts.—The Facts of History differ in some respects from the facts of the other sciences. They are facts that have occurred in the past and are not, therefore, subject to present observation. They are thus known only through testimony, either oral or written, and must be accepted on authority. They are also connected by the relation of time, rather than by that of kind and quality, like the facts of the other sciences. They are the acts of free agents, proceeding from the operation of a spiritual being not governed by inexorable law, like the forces of nature, but which is a law unto itself, and which freely chooses its course among the external circumstances that are the conditions of its actions.

The Philosophy.—History was formerly only a recital of the actions of mankind; but recently attempts have been made to form a Philosophy of History. The great thinkers of the world have looked over the drama of human experience, and have endeavored to ascertain the influences which have been operative in moulding the events of the world. The object has been to trace the action of causes and deduce certain principles which may serve as a guide to statesmen and rulers in conducting the affairs of nations. Viewed in this light, history has been happily styled "philosophy teaching by example."

Systems.—Among these, three great classes of thinkers have presented three distinct methods of explaining the existence of historic events. These three theories are denominated the *Materialistic*, the *Spiritualistic*, and the *Theistic* theories The Materialistic Theory holds that the events of history are caused by the physical conditions by which man has been surrounded. The Spiritualistic Theory holds that man is a free agent and has determined his own actions in view of the circumstances under which he was placed. The

Theistic Theory maintains that man's actions have been determined by conditions imposed upon him by God.

Difficulties.—History presents many difficulties not met with in the other branches of knowledge. Many of the events occurred so far back in the past that it is impossible to know, in many cases, whether what is recorded is true. Many of them have been handed down by tradition, and are, no doubt, partially if not wholly false. The prejudices of mankind have so warped their judgment and statement of the events of their times that it is difficult, if not impossible, to know what was the truth in particular cases. Several long-believed historical statements have recently been shown to be untrue; and we know not how many things we believe to be facts that never occurred. So great are these difficulties that Walpole declares "all history to be a lie;" Napoleon said, "History is but a fable agreed upon;" and Dumas remarks that "Truth is very liable to be left-handed in history."

In the philosophy of history, the difficulties are still greater. The motives of different men are so different, the effects of circumstances on different persons are so diverse, the influences of the external world on people vary so greatly with their intellectual development and the moral influences thrown around them, that the attempt to ascertain the causes of men's actions, and to predict the future condition of the race, is a problem of surpassing difficulty.

Historical Works.—The works on the facts of history may be classified into the Fragments of History, Universal History, Compends of History, and Detailed History. Fragments of History embrace the events of a particular period or the life of some particular person. Universal History presents an account of the principal nations of the globe in a connected narrative. Compends of History embrace a brief and comprehensive narration of the events of a nation or of several nations. Detailed History contains a full account of some nation, people, or particular person or event.

Value of History.—The teacher should have a clear idea of the relation of a subject of study to a general system of education. He should know its object and importance. that he may be able to teach it with appreciation and skill. A few words will therefore be said concerning the value of the study of history.

1. *The study of history gives culture to the memory.* History consists of a narration of facts. These facts are to be committed to memory; they are valuable to the student only as they are retained in the mind. They cannot be thought out, they can only be acquired and remembered; hence history is especially a memory study. Only a person with a good memory can become well versed in history; and among all the studies history stands first in giving exercise and culture to the memory.

2. *History gives culture to the imagination.* It deals with events and incidents, and these rise up before the mind as pictures of human action. To study history properly, the student must imagine the scenes as they are portrayed by the pen of the historian. The events of the past should pass before the mind like the pictures of a panorama. This brings the imagination into vigorous activity and affords it a fine field for its operations. Indeed, no school study affords such an opportunity for the culture of the imagination as history.

3. *History cultivates the power of probable reasoning.* Not only are the facts of history to be remembered, but their causes are to be ascertained and the probable effects estimated. This requires what is called probable reasoning. The historian must weigh consequences, estimate the effect of conflicting and interacting causes, and with a sure prevision endeavor to read the future result. History thus trains that power which prepares for thinking correctly on the practical affairs of life, to a greater extent than any other subject, unless it be Ethics or Political Economy.

4. *The study of history gives moral culture.* History deals

with the actions of mankind; and these actions contain a moral element. We see the motives which inspire and the results which flow from these actions. We see the consecrated labors of the good, the devotion of the patriot, the fortitude of the martyr, and our souls in admiration are lifted up into a higher plane of moral feeling. We see the meanness of the ignoble, the craft and falsehood of the unprincipled, the corruptions of the base and degraded; and the soul turns instinctively away from the low and vicious to the pure and virtuous. The noble and the ignoble, the generous and the selfish, as they stand contrasted in the pages of history, awaken in us admiration for the right, and detestation for the evil. We long to emulate the deeds of heroes and patriots, and thus a desire for good and noble actions is excited in the mind. For moral culture, a boy should go to history rather than to moral philosophy.

5. *The study of history prepares for citizenship.* In it we read of the value of wise and wholesome laws, and of the political vices that sap the foundations of society and the state; and thus learn what to do and what to avoid to secure the good and the honor of one's country. This knowledge is especially useful in a republic, where every man is a voter. The freeman's ballot should be an intelligent ballot; an ignorant ballot is a curse to a republic. Every voter should be familiar with the past history of his country, and should be guided in his voting by lessons of wisdom learned from the actions of the wise men who have shaped the destinies of the nation. The flame of patriotism is kindled and nourished by the study of the patriotic deeds of our forefathers; and the object of school studies is to make patriotic citizens as well as wise and virtuous men.

Divisions for Teaching.—For the purpose of instruction we divide the subject of history into three parts: 1. The Elements of History; 2. The Advanced Course in History; 3 The Philosophy of History. We shall give a brief discussion of the methods of teaching the Elements of History and the Advanced Course in History; but the Philosophy of History, not being appropriate to the public school, will not be considered.

I. Teaching the Elements of History.

By the Elements of History we mean such elementary instruction as every young pupil is prepared to receive before it is thought best to have him study and recite the subject from a text-book. It embraces a large number of interesting events and incidents which are suited to the taste and capacity of young pupils. We shall mention a few Principles of Instruction to guide the teacher in his work, and then briefly indicate the Method of Instruction.

I. Principles of Instruction.—The teacher of the Elements of History should be guided by the following principles. The necessity of these principles is enhanced by the fact that they have been frequently violated; and that the vicious methods used have generated a distaste for the study in the minds of learners.

1. *Instruction in the elements of history should be given orally.* No text-book should be used in the early lessons in history. The pupil is not to be required nor permitted to prepare and recite a lesson from a text-book. The child who attempts to learn history from a text-book usually commits the words but learns little history; the historical fact escapes his attention in his effort to commit and recite the words of the book. The teacher is to give the facts orally, and have the pupil remember and reproduce them. There is no objection to the pupils reading a book on the subject; but the common method of having young pupils recite lessons from a text book should be discontinued.

2. *Instruction in the elements of history should begin at home* We should first give the pupil some knowledge of the history of his own country. He will be more interested in the

events occurring in his own land, and will understand them better. From the events occurring here, he will naturally desire to pass to the events which transpired in other countries. Thus, from the history of America we are naturally led to the history of England and France; from these we pass naturally to Rome and Greece, which in their turn lead us to Syria, Persia, and Judea. It is thus clear that we should begin at home. pass to the history of related countries, and then from the history of particular countries to General History.

3. *The basis of instruction in the elements of history is biography.* Children are more interested in persons than in events. What a man did; how he struggled and suffered and triumphed; what he accomplished or how he failed;—all this is of absorbing interest to a child. Primary history should, therefore, be largely personal. Biography is the soil out of which the tree of history is to grow for a beginner. The events of history are to be made to cluster around some personal character; the life of some great leader or patriot is to be the centre from which we are to view the historic story.

4. *The first lessons in history should be presented in the form of narratives.* Children are fond of story-telling. They will listen for hours absorbed in the relation of interesting personal events. It was thus that the traditions of nations were sung or rehearsed in the early days of the world. Our fathers refer with delight to the revolutionary stories which were told to them, when children, by their sires or grandsires, around the fire of a winter evening. Such incidents linger in the memory, and cultivate a taste for historic knowledge, which in the present generation seems to be on the wane. Let the teacher fill his mind with the stories of history, and relate them to his pupils, and he will find breathless attention and a growing interest in historic knowledge.

5. *Instruction in the elements of history should be given in connection with geography.* History and geography are

closely related, both in their nature and interest. To know the location of a country and the character of its people, is to awaken the inquiry, When was it settled? by whom? and what has contributed to its growth and development? History and geography should, therefore, go hand in hand in primary instruction. We should give historic facts in connection with our lessons in geography, linking the historic events to the localities of the maps which we name and describe.

II. Methods of Teaching.—These general principles indicate the character of the course in teaching history to beginners. We present also a brief statement of the method to be employed in actual instruction.

Teacher's Statement.—The teacher will state but a few facts at a time, and then have the pupils repeat these facts. He will then state a few more facts, and have them repeated. Then have both groups of facts repeated; and then proceed to a new statement. It is a mistake to repeat too many facts at one time, as the pupils' minds will begin to wander, and very little will be understood or retained. When the lesson is a connected narrative, the unbroken statement may be longer, as the interest of the story will hold the pupils' attention.

Teacher's Manner.—The teacher's manner should be conversational. He should be careful to avoid a mechanical and declamatory method of speaking. Do not attempt to give lectures on history to little children. We have seen teachers take all the interest out of the subject by the neglect of this simple suggestion. There should be a plain narration of facts, in a simple conversational style, as if the teacher were talking familiarly with the pupil. He should also endeavor to portray the events so that they will stand out as pictures before the child's mind, and seem not like a school-room task, but like a reality, to them.

Pupil's Recitation.—The pupil's statement should be partly topical and partly interrogative. Call on one to tell all he can, and then on another to add what may be omitted, and then on another, etc. Let one tell one thing, and another another thing, when the lesson can be naturally divided into parts. It is interesting to see how the eyes will flash as a new fact rises into the memory which was forgotten by the pupil reciting. When there are facts not remembered, let the teacher call them out by appropriate questions. Then, after all the facts are brought before the mind again, let some one give the whole story, connecting all the events together in their proper order. Do not be afraid, with little children, to have them tell the story over and over, as their interest in the relation will prevent their tiring of the facts related.

Biography.—The teacher should remember to make biography, so far as possible, the basis of history. He should tell the pupils about Columbus, his birth, travels, disappointments, voyages, triumphs, disgrace, etc. Tell them of Isabella and her jewels, of Captain John Smith and his adventures, of Pocahontas and her touching fate, of Henry Hudson, Miles Standish, Roger Williams, William Penn, Lord Baltimore, etc., and make the historic events cluster around these personalities. Coming down later, we will see that stories of Adams, Warren, Patrick Henry, Washington, Jefferson, etc., will unfold the history of the Revolution and the establishment of the nation. The stirring events of the Rebellion can be unfolded from a recital of the personal actions of Lincoln, Grant, Lee, Jackson, Sherman, etc.

Blackboard, etc.—The teacher should use the blackboard to indicate the location and relation of the principal events. The routes of voyagers, the march of an army, the line of battle, the location of forces, etc., can all be represented on the board. Historical charts, pictures, engravings, etc., will add interest to the description of places, persons, and events.

Outline.—The teacher should have an outline of the course in the elements of history to guide him in his work. This outline he can fill up from his memory, or by reading especially for the purpose. Such an outline will give definiteness and system to his instructions, which is a point not to be lost sight of. In our Model School, where the outlines of history are taught a year or two without the text-book, we place in the hands of our student-teachers an outline of the course, and require them to fill out and follow this outline in their instructions.

Children Read Histories.—Children should be encouraged to read some suitable books on historical subjects. It is difficult to find works adapted to the capacity and taste of young children, many of the works written for this purpose being beyond their comprehension. Abbott's histories, though written for the young, are better adapted to adults than to children. Even Dickens's *Child's History of England* can hardly be read with interest by a child under twelve years of age. Such works as Miss Yonge's *Little Duke* and *Prince and Page*, Peter Parley's histories, or Goodrich's *Child's History of the United States*, may be read by children with absorbing interest. It will be well to allow pupils who have been reading any little work on history, to relate to the class what they remember of it. The teacher should often read historic narratives to the class, and have them repeat the same.

Narratives.—The histories for children to read should be written in the form of narratives. Children take special delight in the stories of history. They love to read about Columbus and his discovery of America, about Isabella and her jewels, about John Smith and his wonderful adventures, about Cortez, and Pizarro, and Alfred the Great, and Waliace, and Bruce, etc. An historical story like *The Little Duke* will be read and reread by a child until it is committed to memory. The author who will write a series of such books for children, and really adapt them to the minds of children, will confer a great boon on the boys and girls of the country.

II. Teaching Advanced History.

By the Advanced Course in History, we mean a course in which pupils are required to study the lessons in a text-book and recite them. The course should include the history of our own country, the histories of England and France, and a work on General History. It may be more or less full, according to the advancement of the pupils and the nature of the school. In treating this part of the subject we shall speak of the Nature of the Text-book and Recitation in History

I. Nature of the History.—The first requisite in teaching history is a good text-book. History is one thing, and the manner of presenting it is another thing. The events may be presented in a variety of ways, and the value of a text-book depends almost altogether upon the manner in which the facts are stated. We shall mention briefly the characteristics of a good text-book on history.

Systematic.—The text-book should contain a systematic presentation of the subject. In the primary course, history was presented in fragments; in this course there should be a narration of continuous and connected events. Among the multitude of historical facts, this is not easy to accomplish; and the skill of an author is especially shown in so selecting and connecting the events that the pupil may have a continued narrative and see the relation of all the parts.

The Style.—A work on history should be written in a clear and simple style. This is an important suggestion, as in no text-book is there a greater temptation to redundancy and an inflated form of expression. It is a requisite, however, often overlooked or not attained. Many of our text-books on history are so complicated in their forms of expression that the young pupil can scarcely understand them; and an attempt to recite a lesson from them results in repeating, parrot-like, the words of the text-book. Even in the historical works of the great masters, the style is often too ornate and involved.

Macaulay's style is better adapted to oratory than history; and others have attempted to rival his brilliant periods. The ideal historic style is that of Bancroft and Prescott; and for school histories no one has excelled Goodrich.

Leading Events.—The text-book in history should present the great leading events of the country of which it treats. All of history cannot be remembered; and the first object is to fix the outlines of the principal facts in the mind of the learner. To burden the memory of the pupil with details, will result in giving no well-connected knowledge of anything. Excessive minuteness of statement in a text-book on history is always a source of vexation to teacher and pupil. We need a skillful grouping of facts, which, though breaking the chronological connection, shows the relation of the events described. It is often well to distinguish between the more important and the less important facts by a difference in the type of the text-book. Mere epitomes, however, aiming to cover the whole ground, are not satisfactory; the use of an epitome is like giving a child an "index to learn by heart."

Biography.—The basis of history is biography. Every great event of history is associated with the lives of some great men who led the movement. Man makes history, and the centre of every great historic event is a man. Lamartine says, "History is neither more nor less than biography on a large scale." History, therefore, cannot be correctly written without referring to the men who created it. What means the history of the Dutch Republic without William of Orange at its centre, or the history of the Commonwealth without Cromwell? Besides this, young people are especially interested in the lives of individuals. They can sympathize with the actions and feelings of a person better than with those of a society or a nation. The lives of great men must, therefore, be interwoven into the text of our school histories.

Historic Centres.—The subject should be presented in the form of epochs, or historic centres. In every country there are great prominent events which stand as the centres about which cluster the minor events. It is these great events that we need to fix in the memory with their dates. They stand as "historical nuclei;" and when well established in the memory, will suggest the facts related to them and growing out of them. Thus, the Age of Augustus, the Age of Elizabeth, the Reformation, the Crusades, etc., are suggestive of many accompanying events in general history. In the history of the United States, such divisions as Discoveries, Settlements, the French and Indian War, the Revolution, will serve as the basis of the historic record.

Lively Pictures.—The text-book on history should present lively pictures of the past. A mere dry statement of historical facts is a very dry thing for a child to study. We need more than the dry bones of the subject, more than a skeleton; we need a body of facts animated with a living soul. History can be made as interesting as fiction, and if so presented it would prevent our young people from wasting so much time over the trashy works of modern fiction. For reading, the historic novel, such as Scott's, Yonge's, and Muhlbach's is highly recommended to the student. The text-book on history can catch some of this spirit, even if it must be more systematic and condensed. The events of history should be made to move before the mind of the student like the pictures of a panorama.

Maps and Charts.—The text-book on history should contain carefully-prepared maps to indicate the location and relation of the events described. This is a very important suggestion; it is a great defect of a text-book to be deficient in good maps. Maps would also be of great advantage to the larger works on history, written for adult readers, for it is very unsatisfactory to spend time in searching for a map representing the country at the time of the events narrated. Historical charts, either in the book or in the form of maps or atlases, are also of great value in teaching history.

Illustrations.—The text-book on history should be copiously illustrated. Many things referred to cannot be described so that the pupil will obtain a clear idea of them. A good engraving will often give almost as accurate an idea as the object itself. Pictures of the Indians, of their wigwams, their bows and arrows, their writing upon the rocks, etc., convey a very correct notion of the things represented. Even representations of celebrated buildings or places, portraits of eminent men, illustrations of some prominent event, will aid the pupil in gaining a clear conception of the subject and in fixing the events in his memory.

Wars, Kings, etc.—School histories should not be a mere record of wars, and the names and lineage of sovereigns. The committing of these to memory, some one has truthfully observed, is in no proper sense the study of history. But the historian must be equally careful to avoid the opposite error of omitting those great military events and characters which have, to so large an extent, guided the current of history. Kings, queens, courts, great leaders, battles, and sieges, have so largely decided the fate of nations and the progress of civilization, that they cannot be lightly touched upon by one seeking to know the great events of history and understand their causes. "In all times past, the lives of a few great men have formed the warp of history, while those of the masses have been but the filling."

Cause and Effect.—The events of history are the results of facts and influences which have acted as their causes. The mind, in contemplating these facts, naturally looks backward and inquires after the events which caused them. The student of history also endeavors to penetrate the future, and predict the coming events as the results of present conditions. In other words, he delights in dealing with the causes and effects of historical events. The facts of history thus prepare and lead naturally towards the philosophy of history.

The text-book should recognize this want, and endeavor to meet it. While there can be no formal treatment of the philosophy of history, the general relation of events with respect to causes and effects should be indicated. The pupil should be led to see the baneful results of ambition, the dishonor of a nation through the violation of justice, the events which brought about a revolution, the causes which resulted in a decline or advance of freedom, etc. History will thus be what it has been so happily styled, "Philosophy teaching by example." It thus becomes a great moral teacher, lays the foundation of intelligent citizenship, and cultivates an appreciation of liberty and the means of preserving it.

General History.—In works on General History, two methods may be used, the *ethnographic* and the *synchronistic*. The Ethnographic Method describes each nation in succession throughout its entire history. The Synchronistic Method groups the historic events into periods or epochs, and narrates the events of such a period, each nation coming in where it belongs in the period. In ancient history, the ethnographic method must be mainly used, as the nations were essentially separate, appearing upon the stage at successive periods, and rarely joining in any one general movement. In some cases, however, as in the history of the states of Greece, the synchronistic method must be mainly followed.

In many cases, the historic movement is carried along by some particular nation, as the representative, for the time being, of some controlling idea or principle, the other nations playing a subordinate part. In other cases, the nations share very nearly equally in the progress of events, no one occupying the prominence of leadership in the movement. In both of these cases, the synchronistic method is preferable. It is often necessary, however, to make a compromise between the ethnographic and synchronistic methods.

In histories written for young pupils, the ethnographic method is usually preferable. The description of periods will often give only a confused picture of the whole. A pupil needs to have a good general outline fixed in his mind before he can well attend to the grouping. He must first attend to the order of time, or his subsequent reading and study will be embarrassed. The grouping of the details of the history of each individual nation around some central epoch is similar to a generalization from facts in the natural sciences, and naturally follows a knowledge of the facts themselves.

II. The Recitation in History.—The Recitation in History should be modified by and adapted to the study. It resembles in many respects the recitation in geography, though it is less technical and requires more continued narrative than most subjects in geography. It adds the element of time to place, and thus moves with a current of events. The subject of history allows perhaps as little variety in the recitation as any subject taught; and yet it requires talent and skill of a high order for real artistic teaching.

Teacher's Preparation.—The teacher must be thoroughly prepared on the subject of history. He should be familiar with all the leading events and their relation to one another; and be well prepared also on the details of the special subject he is teaching. He must also be thoroughly acquainted with the text-book he is using; he must know what facts the author presents, the order in which they are given, and the amount of details into which he enters. This is a necessity in good teaching; no one can hear, satisfactorily, a lesson prepared in a given text-book, unless he knows the text-book himself. The teacher must thus be master of the text-book as well as of the subject.

The teacher should also be a good talker. He should not only know the facts, but should learn how to present them in a lively and interesting manner. In no class is a ready and brilliant talker so necessary as in history. The teacher should have a fund of biographical incident, of interesting personal anecdotes, and a happy talent for description.

Pupil's Preparation.—In preparing a lesson in history, the pupils should first read over the lesson and obtain a general idea of the leading events. They should then fill up the details, linking them in their proper order. The words of the text-book should not, as a rule, be committed; though happy and choice forms of expression may be memorized. A mere committing of the language, as is too often the case with pupils in our history classes, is altogether wrong. An effort should be made to see the relation of the events so that they are not remembered as isolated facts, but that one fact shall suggest another. In many cases, the writing of an outline will aid in preparing for the recitation.

Topical Recitation.—The recitation in history should be mainly topical. A pupil should be called upon to recite the first topic, another the next topic, another to take up the narrative where the previous pupil leaves it off, and so on throughout the lesson. The order of events in the text is to be closely followed, though there should be no slavish dependence on the book. The pupils should be encouraged to express the facts in their own language, bearing in mind that it is a clear conception of events that is required. At the close of a topic, omissions may be supplied and corrections made by the class and the teacher.

Order of Recitation.—The recitation should usually proceed in the order of the occurrence of the events. It may also begin at a certain point and trace the events backward from consequent to antecedent. The former method is called the *Progressive* order; the latter, the *Regressive* order. The progressive method is preferable for the first statement of the lesson; the regressive method may be used for the re-statement of a lesson. The regressive method is especially suitable for a general review of the events of a given period.

Questioning.—At the close of the recitation of a topic, the pupil should be examined on it to see that he really has a clear understanding of it, and is not merely repeating the text-book. The teacher should see that he has in his mind a vivid picture of the events, and not merely a list of words in his memory. He should be required to state the leading events, to show their relation to one another, to trace consequences to their antecedents and antecedents to their consequences, etc. In no study is judicious questioning so valuable as in the recitation of history.

Reviews.—At each recitation there should be a review of the important events of the last several lessons. Such a review will serve to impress permanently all the great leading facts upon the memory, which are all that the student can be expected to retain. This review may be by questions requiring brief answers, or the teacher may require the pupils to state in order the most prominent facts, etc. It may follow either the progressive or regressive order.

New Matter.—The teacher should add some new matter at nearly every recitation. This may consist of greater details on the topic discussed, or a statement of the relation of these events to contemporaneous history, or the causes of these events, or the results to which they led. The teacher should be all alive to the subject, and inspire his pupils with an equal interest. Historical knowledge, flowing from the lips of the living teacher, will make an ineffaceable impression, and, what is still better, cultivate a historical taste and give an ideal of high historical culture, which will be worth more to the pupil than the history he learns.

Reading History.—Pupils should be encouraged to read more detailed works on the subject they are studying. Of course, this can be done to only a limited extent, as their time is required for their other studies; but even a short course of reading will do much to cultivate a taste for history, and awaken a desire to continue the study, and to make themselves familiar with the leading events in the history of the world. If the school course in history accomplished no other object than to awaken an interest in historical reading, it would accomplish a great work.

Discussions.—Pupils should be encouraged to reflect upon the actions of men and nations, and express the opinions thus formed. Was the action under the circumstances right? What would have been the probable result had another course been taken? What do you admire in the character of Columbus? Of Washington? Of Jefferson? Of Adams? A discussion on some historical event upon which opposite sides are taken is also recommended. Such exercises will give a reality to the study, awaken a deeper interest in it, and tend to fix it more permanently in the memory.

The Dates.—The question is often asked, Should the dates be committed to memory? Dates are necessary; we not only wish to know the event, but when it took place. Still, all dates cannot be remembered, and to memorize the dates of isolated events is worse than useless. The dates of certain leading events should be fixed in the memory. These become as centres or nuclei to which other events may be referred, and their approximate time remembered. Some dates should be remembered exactly; others may be committed in "round numbers." The proper relation of incidents will aid in remembering the time at which they occurred.

Cause and Effect.—The teacher should cultivate in the pupil the habit of tracing causes and effects in history. The time has gone by when a history lesson should be made a mere recital of events. We need not only to know history but to learn the lessons of history. "All history," says Croly, "is but a romance unless it is studied as an example." Dr. Currie also truthfully remarks, "The ultimate design of studying history is not only to acquire knowledge, but to form the judgment so that it shall be able to apply the lessons of past time to the present;" and the teacher of history should bear this in mind and govern himself accordingly. A fact is dead until it is taken up into the organic life of human society, and becomes a part of that grand organism which stands before the mind in a true conception of history.

Maps and Charts.—A good set of historical maps and charts would be invaluable in teaching history. The maps should be large enough to hang up before the class and be used in the recitation. The pupil should be required to locate the events, trace them from one point to another, show the march of armies, the location of battle-fields, the wanderings of explorers, the course of emigration, etc. Charts are of especial advantage in general history, by showing the chronological relations, each nation and event being indicated in time as countries are represented in space on a map. *Progressive maps*, showing the states and countries, their extent and boundaries at different periods, are also of great value.

Lectures.—Lectures on history in connection with their regular lessons, or at the close of a school course, are beneficial. With young pupils, they should be made conversational, and the leading events be outlined upon the board for them to copy. With more advanced pupils, the lectures may be more formal and continuous. No complete record of notes should be required, as the attempt to take notes will break the thread of their thought and thus mar the effect of the lecture. But little accurate knowledge of history can be left on the mind by a lecture; the principal value is to arouse an interest and leave in the mind those general impressions which prepare for a more detailed study of the subject. The most interesting topics for historical lectures are the lives and times of some eminent person, and the development of those theories called the Philosophy of History.

NOTE.—The Arts of Writing, Drawing, and Vocal Music are omitted from this work on account of the many treatises on them in manuals prepared for teachers.

NORMAL

METHODS OF TEACHING

BROOKS